Big Sky

Clearwater

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
SPRING 1998

In This Issue:

Important Information for Montana Water & Wastewater System Operators!

Special DEQ Phone Directory

Article Solicitation

This publication welcomes articles of interest and random pieces of information regarding anyhting to do with water system, water treatment, or wastewater treatment of any source or type. If you ahve iseas or information which you would like to share with other people operating systems in Montana, please contact the Department of Environmental Quality.

An article may consist of your thoughts and ideas about soemthing you have experienced, perhaps this information might help someone else in their day-to-day work. It could be a technical article developed from research information and library source materials. Information about events happening for education, conferences, or committee's is also of interest.

Please send any information to the address below in care of Rick Cottingham (Spring Editor) or Bill Bahr (Fall Editor) or call us at 406-444-4400.

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The *Big Sky Clearwater* is for
Water and Wastewater Operators
across Montana

In This Issue.....

A Message From the Editor....

Warnings of the Increasing Threat From
Waterborne Diseases

By: Rick Cottingham, Water Quality Specialist/Editor

People of the world have known for a long time that their drinking water supplies can spread disease. As soon as *microbes* were identified then something could be done. Disinfection practices followed and then disease occurrence rates declined. Today, in Montana, waterborne disease outbreaks from drinking water are uncommon, however, they do occur. The potential for them to occur is always present. For some disease there is no treatment available so the infected individual must wait out the recovery period, often a period of several days to a month or more. For some at risk populations there is no recovery.

In recent years, fear of cancer and the ability to measure chemical pollutants in minute amounts has focused attention on chemical pollution of drinking water supplies. However, according to the American Academy of Microbiology (AAM), Americans should be made aware that waterborne diarrheal disease caused by microbiological contamination (bacteria, viruses, etc.) and parasites such as cryptosporidium and giardia exacts high costs in our society-including significant mortality among vulnerable populations. There are warnings that this is apt to increase greatly without better source water protection, proper system inspection and attention to our aging drinking water infrastructure.

"Microbiologically safe drinking water can no longer be assumed, even in the United States and other developed countries, and the situation will worsen unless measures are taken in the immediate future-the crisis is global!" As stated by Dr. Rita Colwell, chairman of the AAM, in her release on their annual report.

Dr. Timothy Ford of Harvard University, recently said, "*The extent of disease and death caused by waterborne pathogens has been underestimated and that governments and policy makers are not taking significant action to counter threats posed by new and resurgent disease, climate change, surface water pollution, and development of antibiotic resistance.*"

Because of the increasingly contaminated global water resource, there has been a rise in waterborne disease worldwide. Developing countries treatment of water and wastes is non-existent or grossly inadequate, and until sanitation is improved, it will be impossible to eliminate waterborne disease. In developed countries, as the United States, deficiencies and aging in treatment and delivery systems, global warming impacts on source water, and the emergence of resistant and more virulent microorganisms pose serious

threats to human health. Diarrheal disease is so common that sufferers frequently downplay it's significance and doctors cannot bother tracing the causes of individual cases. Many cases caused by waterborne agents goes unreported. Few physicians are on the lookout for rare or emerging organisms and laboratory analysis that might alert communities to waterborne disease are rarely done.

In the United States, an increase in waterborne disease is expected because of a number of factors including:

- Newly recognized agents (Crypto, Giardia, Cyclospora) that have a high resistance to chemicals used in water treatment and development of antibiotic resistant strains of pathogens.

- Less immunity to pathogens (because of better sanitary conditions, increased exposure to ultraviolet rays, and a higher population of immuno-compromised individuals) and the resulting higher susceptibility and risk of disease during system failures.

- Global warming alterations of water systems that have stimulated eutrophication (rich in nutrients, shallow in DO), changes in food chain structure, and unrestricted growth of "nuisance species" creating breeding sites for vector borne disease.

- Changes in agricultural production methods, including high-density animal operations carried out in close proximity to urban development, leading to an increase in transmission of animal pathogens to humans.

- Aging and deteriorating environmental infrastructure, particularly in large cities and towns.

In Montana in 1997 there were 408 confirmed cases of waterborne disease which included: Campylobacter (110), Giardia (145), Hepatitis A (69), Salmonella (58), Shigella (9), Cryptosporidium (8), Malaria (2), Typhoid (1), Legionella (1), Cyclospora (1), and Typhoid (1). Fortunately none of these were attributed to Montana public water supply systems. The point being that these diseases still occur and with the right conditions could be attributed to a public water supply system.

Unless Montana devotes appropriate resources and attention through sanitary surveys and corrective measures we could easily become a part of future statistics. Source water protection, sanitary surveys, and the multiple barriers are by far the best insurance that our Montana public water systems can use to protect the public health which relies so heavily on these systems to provide safe, adequate, and esthetically acceptable drinking water. The time to start is now!

Shock Relay Units Stop Costly Plant Breakdowns

By - Paul Backes, Maintenance Coordinator,
Onondaga County Department of Drainage and Sanitation.

Following a series of equipment breakdowns and service interruptions at its Wetzel Road wastewater treatment plant, the Onondaga County Department of Drainage and Sanitation in Syracuse, NY, placed a high priority on reducing downtime and maintenance costs.

The department was seeking a way to eliminate jams from sludge or debris that damaged equipment and led to large repair costs in unmanned or partially manned treatment or pumping stations.

Jamming can occur when heavy sludge loads, excessive debris on the bottom of settling tanks or ice buildups put undue strain on motors and chains.

Such conditions frequently lead to broken chain and flight boards, requiring the tank to be shut down until repairs can be made. Not only does this put the system out of service for several days, but the repair or replacement costs put additional pressure on tight maintenance department budgets.

This type of problem is more common since plastic chain has come into widespread use in settling tanks. While the light weight and non-corrosive characteristics of plastic chain make it well-suited for many wastewater treatment plant applications, it is also not as strong as steel chain.

When a jam occurs, and motors strain to overcome the unexpected load, something has to give. Shear pins, commonly installed in a drive motor hubs, are supposed to be the weakest points in a drive system, protecting expensive equipment from damage. Too often, however, the plastic chain breaks before a shear pin fails, and the resulting damage can be severe. Like the Wetzel Road Plant, the treatment facilities in the Onondaga County wastewater treatment system either operate with daytime crews, were set up as unmanned pumping stations or serve only as small package plants.

In the north section, just one 24-hour-per-day plant is equipped with a central control room to monitor the operation of other nearby facilities.

And since not every operation in the unmanned stations can be fully monitored, it is possible for a breakdown to occur on Friday evening and go unnoticed until the following Monday morning.

To avoid such problems, the department installed a new type of protective device that monitors a motor's output current. When the motor is drawing excessive electric current to overcome the load, the device recognizes a potential problem and cuts off power to the motor.

When a user-selected "load current" and "shock time" are exceeded as the motor labors against a heavy load, the shock relay protective device, manufactured by U.S. Tsubaki, Wheeling, Ill., immediately trips and shuts off the power and prevents damage to the treatment plant.

All movement stops, and damage to equipment, including the plastic chain, is prevented. At that point, removing obstructions is all that is necessary before

resetting the units with the push of a button. Previously, the tan would be taken out of service, a cumbersome and costly process.

The relay unit's continuously adjustable trip points provide the sensitivity and precision lacking in mechanical protective devices such as shear pins. Since four of the units were installed on drive motors in primary and secondary treatment tanks at the Wetzel Road Plant in August 1994, damage from broken chains or overloaded motors has been virtually eliminated.

The relay devices are installed in enclosed electrical panels, protected from the treatment plant environment. The units can be wired directly to a central control computer, so operations personnel will be informed immediately if a drive motor is stopped for any reason.

Since installing its first four units, the department has purchased two additional units for installation on screen rakes, which can jam up when heavy flow brings large objects into the plant.

This is a reprint of Mr. Backes' article in the December 1997 issue of the **American City & County**.

Montana's water . . .

Use it like life depends on it.

Shambles to Spotlight

Lincoln/Lewis and Clark Sewer District, Montana

The Board, which should be a sound decision-making body, was in a tailspin. Bills weren't getting paid. The Secretary/Treasurer could not, in some months, cut a check to pay herself or the system operator. The District was behind on their payments for the original system. The local banker was doing what he could to help with cash flow problems. The Operator's pleas for repair parts and equipment to accomplish his job fell largely on deaf ears. He understood why, maybe better than most.

A state regulatory official called upon Bill Leonard, MAP Rural Development Specialist, to assist the Lincoln/Lewis and Clark Sewer District Board in Lincoln, Montana with their dilemma. Two immediate challenges were isolated that the District would have to address in hopes of reversing the tailspin. 1. A budget/rate structure review and, 2. Policy consolidation enabling Board and staff to address similar inquiries in a similar, if not identical, manner. Sound familiar? Rate structures that haven't been changed in 10 years of the system's existence. Board members and staff making obliging, individual decisions (not always alike) for similar situations, over a 10-year period. Such is a common course of action for a new District serving a very small community. And it works, for a while. Then, as the community grows, major growing pains set in.

To make a point: Not a single bad person ever served on the Board. Some may have had self interests to protect, yes, but nobody ever harbored thoughts of demeaning the District or the demise of the sewer system. As Board members spent long hours in special meetings reviewing a rate structure which had become untenable over a 10-year period, it became increasingly obvious that fairness is virtuous, but not always fully obtainable. A firm, hard-nosed policy and ordinances must be put in place and applied to all. Grandfathering should be closely scrutinized, and time limited where possible. The Board makeup changed as the rate structure review process proceeded.

Perhaps one of the most memorable capacity building incidents occurred during a Board meeting at which an evolving policy on commercial facility grease traps was being discussed. One Board member, apparently assuming the role of senior citizen representative, argued that the community's Senior Citizen Center could not afford the installation and maintenance of a grease trap and should not be required to install one. Another Board member countered with the fact that many meals are prepared in the Center's kitchen. *Stalemate.* Bill saw an opportunity to drive home a message. "The Board's responsibility is first and foremost to <u>the System</u>, providing and maintaining reliable service for <u>all</u> the users. The District Board is not designed to work on a precinct or special interest group basis." The issue was resolved and the Board member remains.

Three years from when the tailspin began, the District is in the black, the Operator and Secretary/Treasurer are paid on a regular basis, the original loan to build the system is within months of being paid off, the Operator receives much of the equipment and repair items he seeks and, most remarkably, the community recently supported a bond issue to pay the local share on a forthcoming lagoon expansion project. A CDBG grant was awarded to help with a project. The Secretary/Treasurer has requests to make presentations at state-wide workshops and community meetings to explain the very significant turn-around. The community recognizes the District Board as a strong, responsible body. Meetings have gotten notably shorter. It doesn't get much better than that!

APPLICANTS PASSING EXAMINATIONS FOR FULL CERTIFICATION OR OPERATOR-IN-TRAINING (*OT*) 1996-1997 WATER SCHOOLS

NAME	CITY	CLASS *1*'S
ALCORN, Perry	NMC	1B*ot*
BAKER, Dennis A.	East Glacier	1B
BALL, Walt M.	East Glacier	1B
BLATTER, Patrick	Great Falls	1B*ot*
BEAUDRY, Haley	Butte	1A
BRACE, Ed	Neihart	1B*ot*
BRADLEY, Richard	Billings	1B
BROSZ, Catherine	Bozeman	1A*ot*
BROWN, Gregory	Cenex Refinery	1D
BRUNS, Robert L.	East Glacier	1B
BURKE, Ron	Gardiner	1B*ot*
BURKE, Tom F.	Billings	1C*ot*
CARLSON, Karl Jr.	NMC	1B*ot*
CLEMENTS, Clint	Butte	1AB*ot*
DURHAM, Jeffrey D	Conrad	1A*ot*
ELDRED, Randall	Butte	1B*ot*
EMERICK, Shaun	Billings	1C
FLADLAND, Jason	NMC	1B*ot*
GIESER, Bernard	Billings	1D
GREY BULL, Raymond	Billings	1B*ot*
HANEWALD, Jack	Billings	1B*ot*
HARDINGER, Dail	Great Falls	1A
HARRISON, Brian	Billings	1D
HAUGEN, Jeffrey	NMC	1B*ot*,1C*ot*
HESTER, Greg	Havre	1A*ot*,1B*ot*
HOCKENBERRY, Tim	Whitehall	1B
HOTZEL, Roger	Bozeman	1A*ot*
HUGHES, Roy	Missoula	1A
JOHNSON, Jimmy D.	Havre	1B*ot*,1C*ot*
KELLY, Danny L.	Paradise	1A*ot*
KUIPERS, James R.	Butte	1C*ot*,1D*ot*
KURK, Jackson	Bozeman	1C
LEAR, Paul	Gardiner	1B*ot*,1C*ot*
LEFFLER, Chris	Billings	1C*ot*
LEVESQUE, Jerry	Conrad	1AB*ot*, 1C*ot*
MAVITY, Monte	Billings	1C*ot*
MAXFIELD, Lynn	Cut Bank	1B*ot*
McMANN, Alexander	Havre (NMC)	*1ABot*, 1C*ot*
McPHIE, Joe	Gardiner	1D
MINNETI, Eric	Havre	1B*ot*,1C*ot*
MOECKEL, William	Bozeman	1A*ot*
MORIN, Randy	Bozeman	1C*ot*
NIESKENS, Mike O.	Glasgow	1B*ot*
O'LEARY, Earl Q.	Helena	1A*ot*
OVERCAST, John	NMC	1A*ot*
PALAKOVICH, Tom	Whitehall	1B*ot*
POWERS, Mark	Butte	1A,1B*ot*
REARDON, James T.	Havre	1B*ot*
REIFSCHNEIDER, Carol	Havre	1C*ot*
ROACH, Mark C.	Billings	1Bot
ROARK, Brian	NMC	1A*ot*, 1B*ot*
ROUNS, Dan	Brady	1B
SKOGEN, Roger	Valier	1C*ot*
SOLBERG, Brian	Havre	1B*ot*,1C*ot*
SOLUM, Wayne	Poplar	1B*ot*
TACKE, Anthony	Missoula	1A*ot*
TEEL, James	Chinook	1B
THATCHER, Gene	Butte	1A,1B*ot*
THOMAS, George	Stevensville	1B
TUERO, John	Missoula	1C
VOSEN, J. Scott	Havre	1C*ot*
WALDNER, George G.	Cut Bank	1B*ot*
WEAMER, J. Scott	Bozeman	1C
WEAST, Mary	Red Lodge	1B*ot*
WEBER, Jayson	Nashua	1A*Bot*,1C*ot*
WILLIAMS, Jason	Havre	1B*ot*,1C*ot*
WYRICK, Lisa	East Glacier	1B

NAME	CITY	CLASS *2*'S
ALCORN, Perry	NMC	2C*ot*
ALLEN, Ken	Willow Creek	2C*ot*
AUGARE, Steve R.	E Glacier	2B*ot*
BUTCHER, Tom	Livingston	2A3B
CARTER, Ralph	Hungry Horse	2C*ot*
CUMMINGS, Michael	Sidney	2A3B
DOMKE, Doug	Livingston	2A3B*ot*
DOMKE, Douglas	Livingston	2C*ot*
FELLER, Rodney	Hardin	2C*ot*
FORD, Michael	Kalispell	2A3B
HALPIN, Thomas C.	Big Sky	2A3B
HOAG, James	Bozeman	2C*ot*
HULSE, Thomas	Billings	2B*ot*
JENKINS, Grady	Columbia Falls	2C*ot*
MARTIN, Michael	Lewistown	2A3B*ot*
MUSIALOWSKI, Joe	Kalispell	2A3B*ot*
PARKE, Brad J.	Hamilton	2C*ot*
PERRY, Mark A.	Babb	2B
PITZEN, Michael	Bigfork	2A*ot*,2B*ot*
REED, Richard E.	Col Falls	2A3B*ot*,2C*ot*
REICHENBACH, Andy	Billings	2A*ot*
SCHWEIGERT, Tom	Livingston	2A3B*ot*
THOMAS, George	Stevensville	2A
WHITE, Dustin	Wolf Point	2A

KEY

A = Water Distribution Operator
B = Water System Operator
AB = Well Water System Operator
C = Wastewater System Operator
D = Industrial Wastewater System Operator
ot = Operator-in-training

NAME	CITY	CLASS *3*'S
AUGARE, Steve	East Glacier	3C*ot*
BARKLEY, Tim	Great Falls	3B
BARRERE, Brice	Ekalaka	3A4B
BAYLISS, Geoffrey	Missoula	3A
BOOTH, Ralph W.	Hungry Horse	3A4B
BRADEN, Brad	Wibaux	3C
BRAIDEDHAIR, Martin	N. Cheyenne	3A4B*ot*
BROWNE, Russell J.	Reed Point	3C*ot*
CASTEEL, David L.	Lakeside	3A4B*ot*
CHAPMAN, Gary	Helena	3C*ot*
CARTER, Tom	Frenchtown	3A4B,3C
CHARLTON, Harold	Roundup	3C
CLARK, John	Winnett	3C*ot*
CONWAY, Michael	Columbus	3A4B
CRISP, Ken	Crisp Water Testing	3A
CUMMINGS, Michael	Sidney	3C*ot*
DALY, Moses	Whitefish	3A4B,3C
DAMBERGER, John	Cut Bank	3C
DAY, Donald L.	Libby	3C
FRIEDE, Norman	Victor	3C*ot*
HADFIELD, Bill	Boulder	3A4B*ot*
HOWELL, Marc	West Yellowstone	3C*ot*
HUGHES, Roy	Missoula	3B*ot*
HUNKAPILLER, David	Darby	3A4B
JOHNSON, Dorothy M.	Circle	3A4B
JUDD, Troy	Gore Hill	3A4B*ot*
KING, David	Bozeman	3A4B, 3C*ot*
KLEIN, Johnny	Broadus	3A4B*ot*
KNIGHT, Rex	Wibaux	3C
KNIGHT, Rex Jr.	Wibaux	3A4B
LACY, Jerry	Thompson Falls	3A
LAMBETH, Shawn	Missoula	3A4B, 3C
LITTELL, William	Big Timber	1B*ot*,1C*ot*
MacDONALD, Waldo	Cascade	3A4B*ot*
McDADE, Benjamin	Eureka	3A4B,3C
McKINZIE, Michael	Troy	3A4B
MICHALSKY, Lee	Butte	3C*ot*
MORKEBERG, Lawrence	Troy	3A4B*ot*
OLLINGER, Craig	Browning	3C
PLANT, Albert, Sr.	Pablo	3C
RAUSER, Tim	Townsend	3A4B*ot*
RUGG, Korey	St. Regis	3C
RUNNING, Loren	Sunburst	3A4B*ot*
SANDCRANE, Alec	Lame Deer	3A4B*ot*
SKORNOGOSKI, Joseph	Havre	3C*ot*
STORER, Steve	Columbus	3C*ot*
SUND, Forrest	Thompson Falls	3A
TACKE, Anthony	Missoula	3B*ot*
THEISEN, Dan	Manhattan	3A4B*ot*
THRELKELD, Terry	Big Sky	3C
VANDERHOEF, Scott	W. Yellowstone	3A4B, 3C
VAN MATRE, Kevin	Fairfield	3A4B*ot*
WEIDOW, Clint	Pinesdale	3A4B*ot*
WEST, Travis	Glasgow	3C*ot*
WENDELL, Walter	Great Falls	3A4B*ot*
WHITTENBERG, Kevin	Thompson Falls	3A
WILLSON, Beverly	Ekalaka	3C

NAME	CITY	CLASS *4*'S
ACKERMAN, Dale	Great Falls	4A,4B*ot*
ADRIAN, Delano	Woods Bay	4AB*ot*
ALEN, Lloyd J.	Augusta	4C
ANSTEAD, Max	Columbia Falls	4AB*ot*
ASTON, Jeff	MAFB	4A
AUGARE, Steve R.	E Glacier	4A
BAKKER, Joseph	Kalispell	4A*ot*
BENNETT William S.	Whitefish	4AB*ot*
BRAIDEDHAIR, Martin	N. Cheyenne	4B*ot*
BURKE, Ron	Gardiner	4A*ot*
BURTCHETT, James	Geraldine	4AB
BUTTERFLY, Roderick	Blackfeet Boarding	4AB
BRECKENRIDGE, Tracy	Dutton	4AB*ot*, 4C*o*
BRYANT, Shawn	Helena	4AB*ot*
BYRNE, Tom	Roy	4AB,4C
BRUNTY, David	Alpine Village	4AB
CARPENTER, Ivan	Plum Creek Mfg.	4AB*ot*
CLARK, John	Winnett	4AB*ot*
CRILL, Michael D.	Virg City	4AB
CUMMINGS, Michael	Sidney	4*C*
DOUGHERTY, Patrick	Three Forks	4AB
DUDLEY, Wayne	Spring Meadows	4A*ot*
FITZGERALD, Thomas	Sun Prairie	4AB
FLETCHER, Kelly	Great Falls	4A,4B*ot*
FOX, Terrance	Whitefish	4C
FRANKS, Robert	Ptarmigan Village	4AB
GALLAGHER, Jeremy	Great Falls	4A,4B*ot*
GAMBRILL, Peter	Bozeman	4AB
GRESENS, JoAnne	Miles City	4C
HARGROVE, Earl	Lewistown	4AB
HENSEL, Brian	Missoula	4AB*ot*
HESTER, Curtis	MAFB	4A,4B*ot*
HILLER, Larry	Missoula	4AB*ot*
HOCKENBERRY, Tim	Whitehall	4A
HOLMES, Russell	MAFB	4C,4AB*ot*
HULSE, Thomas	Billings	4A
HUNKAPILLER, David	Darby	4C*ot*
JACOBSEN, Ronald	Ashland	4AB*ot*, 4C*o*
JEFFERSON, Mark	Great Falls	4A,4B*ot*
JOHNSON, Homer	Flathead County	4AB*ot*
JONAS, DeAnne	Billings	4AB
KEHOE, Kelly	Coram	4AB*ot*
KELLER, Jeffrey	Elk Meadows	4AB
KINDNESS, Lawrence	Fort Smith	4AB
KLEIN, Johnny	Broadus	4C
KLEINDORFER, Stanley	Virginia City	4C
KROPP, Michael	Troy	4C*ot*
LANGEL, Bill	Inverness	4C
MacDONALD, Waldo	Cascade	4C*ot*
McDONALD, Gary	Kalispell	4C
MILLS, Kenneth	Bozeman	4AB*ot*
MONGAR, George	Judith Gap	4AB
MORITZ, William	Shelby	4C
MURDOCK, Rebecca	Spring Meadows	4AB
MURPHY, James S.	Froid	4ABot4Cot
NISBET, Gerald	Lincoln	4C*ot*
PALAKOVICH, Tom	Whitehall	4A
PANKEY, Arthur R.	Libby	4AB*ot*
PRATHER, Lloyd	Red Lodge	4AB*ot*, 4C*o*
PUSHARD, Gerald	Ramsay, Assoc.	4C
RADLEY, James	Great Falls	4A,4B*ot*

NAME	CITY	CLASS 4'S
RANSOM, Marc E.	Missoula	4AB
RASMUSSEN, Glen	Clancy	4AB*ot*
RASMUSSEN, Larry	Great Falls	4AB
RAUSER, Timothy	Townsend	4C
REVELEY, Keal	Darby	4AB
REAVELY, Keal	Darby	4C*ot*
REED, Travis C.	Babb	4AB*ot*
REYNOLDS, Leslie	Bozeman	4AB
RIDDLE, John C.	Lame Deer	4AB
RIFFER, Michael	Great Falls	4A
RIGGS, Kitty	Belle Creek Water	4C
ROUNS, Dan	Brady	4A,4C
ROUSHER, David	Forest Park	4AB
SALACINSKI, Daniel	Lavina	4C*ot*
SAVAGE, Steve	Missoula	4AB*ot*
SEYMOUR, Joe	Ramsay, Assoc.	4C
SHACKLEFORD, Rob	Bozeman	4AB*ot*
SIDDERS, Larry	Belgrade	4AB*ot*
SMITH, Logan	Twin Bridges	4AB*ot*,4C
STEVENSON, James	Ashland	4AB*ot*
TAUSCHER, Tom	Hardin	4A,4B*ot*
TONER, Jerry	Gilford Colony	4C
VOTAPKA, Frank	Emkayan W&S	4AB
WAITE, Robert	Moore	4AB*ot*
WALKER, J.B.	Floweree	4AB*ot*,4C*ot*
WEINMEISTER, David	Nashua	4C
WILKE, Jeffrey	Lakeside	4AB
YOUNGMAN, Leonard	Fort Peck	4C

NAME	CITY	CLASS 5'S
AKTEPY, Paul	Noxon	5AB
AVANTS, Wayne A.	Hamilton	5AB
BENEVENTI, Joseph B.	Jeff City	5AB
BOTTS, Anthony	Big Fork	5AB
BURKHOLDER, Terry	Missoula	5AB
CHENARD, Steve M.	Bigfork	5AB
DAVIS, Larry	Angel Island	5AB
DIX, Richard J.	Helena	5AB
FERREE, Douglas	Wapiti Acres WUA	5AB
GOLDSBY, Richard	Crisp Water Testing	5AB
GRASSER, Scott	N. Fork Trailor Court	5AB
HARTKE, Robert	Bigfork	5AB
HEDEGAARD, Gary L.	Milltown	5AB
HOFER, John	Galata	5AB
JAMES, Marj	Whitefish	5AB
JINGST, Dennis	Wapiti Acres WUA	5AB
JOHNSON, Ronald R.	Terry	5AB
KOMIS, Larry J.	Malta	5AB
KROPP, Michael	Troy	5AB
LADWIG, William	Bozeman	5AB
LERUM, David	Galata	5AB
LERUM, Dean	Galata	5AB
LIECHTI, Mark	Kalispell	5AB
MCDONALD, Gary W.	Kalispell	5AB
MOLLETT, Kathleen	Cooney Enterprises	5AB
MORGEAU, Russell	Polson	5AB
POYNER, Patrick	Woodland Court	5AB
RIDDLE, John C.	Lame Deer	5AB
ROBINSON, Robert	Helena	5AB
SIDDERS, Larry	Belgrade	5AB
SKILLMAN, Edward F.	Livingston	5AB
SMIEJA, Kathy	Bozeman	5AB
SMITH, James	Manhattan	5AB
STAHL, John, Jr.	Ayers Colony	5AB
STROM, Odin	Polson	5AB
THOMAS, Charles	Culligan Water	5AB
TILMANT, James	Kalispell	5AB
WALDNER, David	Valier	5AB
WIEDER, Russ	Arlee	5AB
WILSON, Herman	Livingston	5AB
WURTZ, John	Sage Creek	5AB

CONGRADULATIONS! To all of the above operators who passed their examinations during 1996 & 1997. The examinations for certification require considerable time in study and preparation. Passing the examination represents a lot of hard work and initiative on the part of the individual. Be sure to show your appreciation to your water and wastewater operator for working hard to ensure that they are properly trained to care for your system!

On-site Chlorine Generation

Technology whose time has come

By: Leonard Ainsworth, Environmental Specialist, Rural Community Assistance Corporation, San Marcos, California

While new treatment processes for water and wastewater systems come and go, some are worth a second look. Here RCAC's Leonard Ainsworth examines one progressive treatment that is proving its worth across the country. In addition, with the low operation and maintenance cost of on-site chlorine generation, the system recovers its investment quickly.

Hundreds of small water and wastewater operations in this country and throughout the world generate chlorine on-site for their water and wastewater treatment process. However, this progressive technology is little known by many water/wastewater professionals. Typical applications have been limited to smaller systems and with field staff so busy, they are rarely heard from. With the ever-increasing commodity and shipping costs of elemental ("gas") and compounded (hypochlorite) chlorine, coupled with the escalating safety requirements of these hazardous materials, on-site generation (OSG) of process chlorine is becoming more attractive every year for both large and small facilities. Available systems provide three - to - 2,400 pounds per day of chlorine in the form of a dilute sodium hypochlorite solution produced by the electrolysis of brine.

Chlorine is manufactured commercially by essentially the same process: a salt solution (NaCl) is the electrolyte in a special cell with active chlorine forming at the anode. OSG is designed to produce 0.8 percent NaOCl within a weak salt solution. This limited hypochlorite solution strength (about 1/15 the strength of commercial bleach and 1/7 that of household bleach) is below the lower limit deemed a "hazardous liquid," with obvious economic and safety advantages.

Recent OSHA/EPA regulations and modern fire code standards do, or will soon require, expensive gas "scrubbers" for all gas chlorine connected containers (historically the most cost-effective form of the element.) In addition, liquid systems using commercial sodium hypochlorite require secondary containment structures around their storage tanks. This high-strength bulk form of "bleach"degrades significantly from its original 15 percent strength within weeks. Systems that use "dry" chlorine, calcium hypochlorite (HTH - which is quite affordable in first cost for small operations,) requires regular maintenance activities such as cleaning batch tanks, solution pumps and lines of deposits. Thus, when these higher construction costs for gas and liquid chlorination systems and the on-going maintenance with HTH feeding are factored in, OSG compares very favorably in both capital and operations expenses.

Operating costs for ISG center on the local costs of salt and power. Each pound of chlorine (equivalent) produced uses 3.5 pounds of salt and 2.5 kWh (kilowatt-hours) of electricity. For nominal unit costs of $0.01/pound for salt and $0.10/kWh, OSG typically comes in at about $0.30/per pound of chlorine for most regions. This is often far below the delivered cost for gas. The equipment can "pay for itself" in just a few years of operating costs savings, with the

safety and operational advantages as extra benefits.

The manufacturers of modern OSG units have improved and automated the equipment to the degree that the operators' only duties are to observe the control panel daily for proper operating parameters and to dump bags of salt every few weeks. Since the assemblies (which are quite small) including an ion-exchange water-softener, mineral deposits forming within the electrolytic cell are minimal, with an acid cleaning being necessary only every few months. Cell voltage is controlled at a low value to maximize electrode life, which is on the order of three years. Process brine strength and cell current determine chlorine production at the anode, with hydrogen gas continually vented from the cathode. Modern OSG units are fully compatible with plant process control systems, including the provision of chlorine for several days from a stored solution in the event of a power failure, etc.

Equipment suppliers readily provide potential buyers with installation listings in a given region (there are 500+ active units in the USA,) since most are "satisfied customers." Some units have been in operation for as long as 10 years, and some agencies have as many as 20 years on-line.

During my tenure as a general manager of a community service district, we installed three OSG units in 1996, two - 50 ppd systems at new water treatment plants (supplanting a commercial bleach system) and one - 100 ppd unit for a wastewater treatment plant (replacing gas Cl_2). These systems are operating satisfactorily and will recoup their capital cost in operation and maintenance savings in about three years.

In summary, OSG is a well-established but under-utilized technology with obvious advantages over conventional chlorination methods. It is a process whose time has come for design engineers, agency managers and operators alike.

This is a reprint of an article in the Volume 15 Number 3, 1997 issue of the Pacific Mountain Review.

DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMITTING & COMPLIANCE DIVISION
Community Services Bureau
Water & Wastewater Operator Certification

MARC RACICOT, GOVERNOR

STATE OF MONTANA

Phone: (406)444-2691
Fax: (406)444-1374

1520 E Sixth Ave
PO Box 200901
Helena, MT 59620-0901

CERTIFICATION EXAMINATION NOTICE
SATURDAY, MARCH 14, 1998 8:30 AM to 1:00 PM

Examinations for certification as a Water and Wastewater Operator will be given at these seven locations:

BILLINGS	**MSU-Billings (EMC); Student Union; second floor; Yellowstone Room**
GREAT FALLS	**METC; MSU - Northern at Great Falls; 1211 NW Bypass; Room 101**
HAVRE	**MSU-Northern; Hagener Science Center; Room 113**
HELENA	**Cogswell Building; 1400 Broadway; Room C209 (use south side entrance)**
KALISPELL	**Kalispell Wastewater Treatment Plant; 2001 Airport Road; Conference Room (south end of city airport)**
MILES CITY	**Miles Community College; 2715 Dickinson; Room 107 (main building)**
MISSOULA	**4 B's Convention Center; 3803 Brooks Street; Big Sky Room #2**

NOTE, THERE WILL BE NO EXCEPTIONS TO THIS: **By February 27, 1998, as required by ARM 17.40.206, everyone taking examinations must have:**

1. completed an application for certification as a water/wastewater operator;
2. paid application (or renewal) fees for fiscal year 98 which ends 6/30/98; and
3. submitted examination registration slips and fees of $20 per examination. (Combination examinations **2A3B, 3A4B, 4AB and 5AB require $20 examination fee only**).

APPLICATION FEES ARE:

$30 for water (including either or both water distribution or water treatment)
$30 for wastewater

To request application materials or to ask for additional information, call the certification office (Shirley Quick at 444-2691 or Tom Sanburg at 444-3434) or write to:

Department of Environmental Quality
Water/Wastewater Operator Certification
P.O. Box 200901 - Helena 59620-0901

PLEASE KEEP THE UPPER PORTION OF THIS NOTICE

EXAMINATION REGISTRATION SLIP

(To be registered for exam, detach and return this slip with appropriate fees by February 27, 1998)

I will take the examination(s) I have checked below at:

☐ Billings ☐ Great Falls ☐ Havre ☐ Helena ☐ Kalispell ☐ Miles City ☐ Missoula

	1	2	3	4	5
A - Water Distribution	____	____	____	____	____
B - Water Plant	____	____	____	____	____
C - Wastewater Plant	____	____	____	____	

NAME: _____ SYSTEM: _____

ADDRESS: _____

MATH REVIEW FOR CERTIFICATION EXAM

MONTANA DEPT. OF ENVIRONMENTAL QUALITY
WATER & WASTEWATER OPERATOR CERTIFICATION PROGRAM

MARCH 13, 1998
6:30 - 9:30 pm

BILLINGS (TENTATIVE SITE)
MSU - Billings (EMC)
Union Building
Second Floor
Yellowstone Room

GREAT FALLS
METC; MSU-Northern at Great Falls
1211 NW Bypass
Room 101

***KALISPELL**
Kalispell Wastewater Student
Treatment Plant
2001 Airport Road
Conference Room

MILES CITY
Miles Community College
2715 Dickinson
Room 107 (main building)

HAVRE
MSU-Northern
Hagener Science Center
Room 113

****MISSOULA**
4 B's Convention Center
3803 Brooks Street
Big Sky Room #2

HELENA
Cogswell Building
1400 Broadway
Room C209
(use south entrance)

These sessions are intended to review basic math for those people with valid applications for the exam being given on Saturday, March 14. **You will never learn everything you need to know at a water school to pass the exam OR to be a competent operator.** the study materials we provide and suggest are designed for entry level operators, **no CECs will be given** for any of these sessions.

* The sessions in Kalispell are taught and **sponsored by Montana Rural Water Systems.** For more information, contact their office at (406) 454-1151.

** The sessions in Missoula will be taught in conjunction with Spring Water School, March 11-14. The math review will be held Friday at 1:00 pm. Spring water school gives each participant opportunities to resolve questions from the self study materials as well as an overview of information. For more information, contact the certification office at (406) 444-2691 or the Montana Environmental Training Center at (406) 454-1151.

Would You Trust Your Drinking Water to Anyone Other Than a Certified Operator?

By Bob Ward, Senior Engineer, Mountain Water Company

Since 1967, the State of Montana has required all community water systems to have certified operators. There are currently about 1350 certified water operators in the State. Mountain Water has 20 certified operators out of 40 employees. We believe that training and educating employees to be as knowledgeable as possible is in the best interest of our company and our community. In 1998, all water systems in Montana will be required to have certified operators. This will affect 182 non-community, non-transitory systems throughout Montana. The emphasis on certification and accompanying training for more people working with water supply is due to a realization of the importance of water quality to human health. Our role has changed from water system operator to being more of a health professional. We need to emphasize to city councils and the general public the importance of the water to our communities.

Two primary areas that certified operators are responsible for human health and welfare are providing excellent water quality and providing sufficient water for fire protection. I would like to discuss in detail some things I feel are important in these areas and also some of the programs Mountain Water utilizes to meet these goals.

Water quality is monitored through mandatory samples for a host of chemical constituents and some microbiological constituents. These samples may be weekly or monthly for coliform bacteria to as infrequently as every seven years for asbestos. The samples are a good snapshot of system water quality; however, they are not frequent enough to provide complete assurance of water quality at all times. Operators need to take other proactive steps to improve or maintain water quality.

Our greatest concern is with microbiological agents. In addition to required monitoring, Mountain Water does additional sampling for bacteria. The raw water of all operating wells is sampled on a weekly basis and all wells are sampled prior to being put on line for the season. We take quarterly Heterotrophic Plate Counts (HPCs) at well and distribution sample sites. HPCs provide information on biofilms in the water systems and high levels of HPCs (over 500) may hide coliform bacteria. After a leak repair, a sample is collected at a nearby tap and tested for coliform bacteria. These efforts provide more information on our water quality and also allows us to pinpoint a potential problem sooner.

A second component of our water quality maintenance focuses on the distribution system. Cross connection control and flushing programs are important aspects on maintaining water quality. The 1997 Legislature passed a law allowing systems to have a backflow program. The Board of Health needs to approve the Administrative Rules; then systems will submit their programs for state approval. Most of the large systems in Montana have cross connection control programs ready to be implemented. A water system in Virginia recently paid over $40,000,000 to replace pipes contaminated by a cross connection event. In Missoula, we have seen antifreeze from driveway thawing systems and water softener beads that have been back siphoned into the system from cross connections. Knowing your customers' water uses is the first step in determining the degree of hazard they pose to other customers and what cross connection control is needed.

Flushing distribution mains at least on an annual basis should be performed to maintain water quality and remove silt, rust and other undesirable material. The flushing program can be as simple as flushing all blow offs to a system of valve closings to flush one direction then the other direction. Fire hydrant flow testing can be done with flushing to kill two birds with one stone.

Fire protection is another key component of our obligations to the public. The Missoula Fire Department wants a minimum of 1000 GPM for two hours available at all hydrants in most residential areas. In commercial areas, the requirement can be as high as 4000 GPM for 4 hours. Concern with not having adequate water for fire protection caused the City of Polson to enact a moratorium on new connections until additional supply is available. Fire flow requirements necessitate mains being sized far larger than would be needed for domestic water only. Mountain Water has adopted a minimum size of 8" for all new mains.

Mountain Water spends a considerable amount of time ensuring that all fire hydrants are operable. Each hydrant is checked on once a year and maintenance performed as necessary. This job has become far easier since we first fixed the worst problems and exercised the hydrants. The hydrants are flow tested to determine available water. The flow testing is done with our crews and the Fire Department. The hydrant caps are color coded based upon available water with under 500 GPM being red, 500 to 1000 GPM orange, 1000 to 1500 GPM green and over 1500 GPM blue. The Fire Department knows instantly which hydrants have the best flow and can select the best one for fighting fires. The color coding is something the National Fire Prevention Association recommends and is an idea I first heard about from the Libby Water Department. The flow tests also show hydrants that don't flow as much water as expected. We usually find a closed valve to be the source of the problem. In one hydrant near a school, we found a 5" diameter rock wedged in the hydrant lead pipe that almost stopped the flow.

We all have more projects than we can complete. We need to prioritize our work and public health and welfare should determine the priorities. Going beyond the regulations on water quality monitoring, implementing a cross connection control program and implementing a flushing program can prevent problems plus improve your customers' satisfaction. Working closely with the local Fire Department on fire hydrants can insure that you have operable hydrants when they are needed. Flow tests also tell you how your system responds and can pinpoint areas that need additional main capacity. The challenges are a many for an operator to deal with especially if he or she doesn't have adequate help.

We are all trying to accomplish the same thing which is provide safe water to our customers. Some resources that are available include the State DEQ, American Water Works Association, Rural Water and other water operators. The Rural Water Conference in February and the AWWA Conference in May are opportunities to meet other people and exchange ideas. Training sessions by METC and others are another great source of knowledge. We all should work together to do the best job possible for the people of Montana. Trained, certified operators are a key to accomplishing the goal of water quality and fire protection.

Mr. Bob Ward will be leaving Mountain Water Company in February, 1998 to take a position in Portland, OR! The DEQ and Big Sky Clearwater Editors would like to thank Bob for all of his dedicated assistance to the Operator Training and Educational Programs throughout his career! Good Luck, Bob!!!

The Clean Water Act Turns 25

October 18, 1997 was the 25th birthday of the Clean Water Act. This year commemorates the twenty-fifth anniversary of this momentous undertaking. Yet, it's an anniversary that could pass with little fanfare as millions of Montanans will use and reuse this precious resource in their homes, farms, businesses and factories day after day as they would any other day.

For water quality professionals like the members of the Montana Water Environment Association, the anniversary is significant. Before 1972 , when the Clean Water Act was signed into law, efforts to treat polluted water didn't always seem to succeed. Some of our waters were so grossly contaminated that they were devoid of life. But by the early 1970s, the American people were demanding action.

Congress responded with the Clean Water Act, which signaled the federal government's willingness to spend significant sums of money to help clean up the nation's water. The act also made it clear the municipalities and manufacturers would be expected to fulfill challenging goals and meet tough new standards within a predetermined time period.

Today, evidence of the Clean Water Act's success is widespread and unmistakable. Most of the water quality problems identified in the 1960s have been solved. People are swimming and fishing in waters that were once impossible to enjoy. Lakes and streams that once offended people's sense are now clean and teeming with life.

This is due in great part to the efforts of water quality professionals around the nation who are successfully treating wastewater. Today more than 100,000 operators, collection systems professionals, laboratory analysts, engineers and scientists are working every day to reserve and enhance water quality. And we have seen their efforts pay off -- here in Montana, virtually every wastewater treatment plant that serves every community in this state resulted from or was dramatically influenced by the provisions of the Clean Water Act. Millions of federal dollars constructed wastewater treatment facilities all across Montana. The Clean Water Act continues to be the vehicle by which wastewater treatment facilities are built, the operators trained and the performance monitored in Montana. Most of the treatment facilities meet discharge levels far more stringent than the Clean Water Act prescribes in secondary treatment. Most Montana facilities are staffed by well-trained personnel who strive constantly to treat the wastewater to levels far better than the permit requires. All Montanans should take a moment this year and reflect on the massive good that has been accomplished by this act. The dollars have been spent well; try to calculate how much pollution has been removed by the facilities the act brought us here in Montana. Remember the vast improvements in places across America, like Georgia's Chattahoochee River, Rhode Island's Narragansett Bay, Cleveland's Cuyahoga River (and Lake Erie), Oregon's Tualatin River, and thousands of other water bodies. While you think about these places of extreme degradation and the successes in cleaning them up, imagine how much more there is to do.

However, we celebrate past achievements, we should not forget that there are new challenges to overcome. Twenty-five years ago, America's water quality experts were grappling with point source pollution (discharges from specific pipes) and measuring that pollution in terms of parts per million. Today, we're dealing with issues such as nonpoint source pollution, which results from sources ranging from highway runoff to air

pollution, and combined sewer overflows, and we can measure that contamination ion parts per *trillion*. That's a million-fold increase from what we could do a quarter century ago. This fact has caused the definition of pollution to change from water quality impacts that people could see and smell to impacts that can be detected only through the use of the most sophisticated equipment by highly trained operators.

To meet these current and future challenges, The Clean Water Act will have to be updated. How? We must set priorities so that limited resources can be targeted to meet the most significant problems. We must ensure that all clean water program activities are based on sound science. Water quality research must receive renewed emphasis. Federal financial assistance must remain. And water quality should be managed on a watershed basis, where pollution sources can be identified, prioritized and addressed effectively.

So, while challenges remain, a birthday is still a birthday and an anniversary is very special when it's the 25th anniversary, and we should celebrate! Montana and other Americans enjoy one of the highest levels of water quality in the world. For that, we can thank the Clean Water Act.

Happy 25th Anniversary!!!

Water Environment Federation Officer to Attend MWEA/MSAWWA Joint Conference

Albert W. Goodman, Vice President of the Water Environment Federation (WEF), is scheduled to attend the joint Annual Conference of the Montana Water Environment Association (MWEA) and the Montana Section of the American Water Works Association (MSAWWA), May 6-8 in Kalispell. Mr. Goodman is the founder and president of A.W. Goodman & Associates, an environmental consulting firm primarily concerned with industrial wastewater treatment projects and small municipal treatment systems. The firm is based in New Albany, Indiana.

Goodman has been involved in various aspects of wastewater treatment for over 25 years, starting as a chemist for the Jeffersonville, Ind., wastewater treatment plant, a position he held for just 3 days, before assuming the duties of plant superintendent. Building on this municipal experience, Goodman entered the consulting field, designing, building and operating wastewater treatment systems throughout the Midwestern United States. An important aspect of Goodman's service to the wastewater field has been training wastewater operators and offering troubleshooting and design assistance to wastewater systems.

Goodman has been a member of WEF since 1975, and has served on and chaired several WEF committees, including Operations Challenge, Safety & Occupational Health and Plant Operations & Maintenance in addition to his position on the WEF Executive Committee. He also represented his member association in several leadership positions and was president of the Indiana Water Pollution Control Association. A professional engineer, Goodman served as President of the GRC Chapter of the Indiana Society of Professional Engineers.

Drinking Water State Revolving Fund

The Department of Environmental Quality and the Department of Natural Resources and Conservation have developed and soon will begin implementing the Drinking Water State Revolving Fund (DWSRF) program. The program will offer below-market loans for construction of public health-related drinking water infrastructure improvements as well as provide funding for other activities related to compliance with the Safe Drinking Water Act (SDWA). These other activities, or set-asides, include administration of the DWSRF program, technical assistance to small communities, source water assessment and delineation, operator certification, administration of the Public Water Supply Program, and capacity development.

The DWSRF program will be similar to the existing water pollution control SRF program. The bulk of the funds comes to Montana in the form of capitalization grants through the U.S. Environmental Protection Agency. Montana provides the required twenty percent matching funds by issuing general obligation bonds, thus using no state general funds to operate the program. Interest on the project loans is used to pay back the general obligation bonds. The repaid principle on the project loans is used to rebuild the DWSRF fund and is used to fund additional projects and set-asides in the future. The federal capitalization grants are only authorized through federal fiscal year 2002; however, federal and state law require the DWSRF program to be operated in perpetuity.

Set-asides

The Drinking Water State Revolving Fund also is charged with funding certain provisions of the federal Safe Drinking Water Act, through the use of "set-aside" accounts. States are given flexibility to set aside specified amounts of the federal drinking water capitalization grant for specific purposes outlined in federal law; in our case these set-asides also are outlined in our authorizing state legislation, HB 483. These set-asides each have different purposes and conditions, and some are mandatory. Montana is funding the following:

Administration -- The Department of Environmental Quality will use this set-aside to fund development of the program and the intended use plan, review of water system facilities plans, review of construction and bid documents, assistance and oversight during planning, design and construction, loan origination work, administering repayments, preparation of bond issuances, and costs associated with the advisory committee and the public comment process.

Technical Assistance for Small Communities -- Through this set-aside, DEQ will contract with technical assistance providers to provide needed outreach programs to small public water supply systems through an integrated approach designed to reach: (1) communities whose systems have chronic violations that threaten public health; (2) communities requesting assistance to correct operation and maintenance problems or to develop needed water system improvement projects; and (3) communities whose systems will benefit from regularly scheduled visits designed to enhance the system's fiscal, managerial and technical capability.

Capacity Development -- Through this set-aside, DEQ is required to ensure that new water systems, systems receiving DWSRF loans, and systems with chronic compliance

problems all have the technical, financial and managerial capability to comply with all of the primary requirements of the SDWA.

Operator Certification -- The Department will also certify operators of non-transient, noncommunity water systems and meet additional training requirements imposed by the 1986 and 1996 SDWA amendments. Tasks will include updating the certification database with non-transient system information, and classifying each system with the appropriate certification class.

Public Water Supply Program -- The Department will assist public water suppliers in the protection of public health through regulatory and compliance assistance and through assistance in engineering design and plan review, operations, maintenance and administration of public water supplies. General regulatory assistance will be provided to help with changing and new regulations. System-specific compliance assistance will be provided to those systems where known compliance and public health issues exist.

Source Water Assessment: Database development -- develop the mechanism and database by which the source water assessment program will be developed. The goal of this effort is to develop a complete database of public water supply source information that includes location, construction and water quality data. The information will be updated as necessary and will be available to the public. This information will be the primary resource to begin the larger source water assessment effort described below.

Source Water Assessment: Delineation and Assessment -- DEQ will develop a program to delineate the boundaries of an assessment area from which public water systems derive their surface water or groundwater, and then identify the origins of regulated contaminants to assess the susceptibility of the system to those contaminants. The source water assessment program will use all reasonably available hydrogeologic information such as data generated by PWS vulnerability assessments, sanitary surveys, routine monitoring, wellhead protection delineations, and delineations or assessments completed as part of a watershed initiative. Emphasis will be placed on the use of a Geographic Information System to ensure the opportunity to use program collected or compiled information within DEQ and other state or federal agencies. Output products of the source water assessment program will include maps of source water protection areas showing the delineations and inventory of potential contaminants, vulnerability assessments necessary for targeted monitoring for chemical contaminants and monitoring relief, and useful information for future regulatory decisions relating directly to the public water supply program and indirectly to other water quality issues such as water quality standards, watersheds, statewide water quality monitoring, and Total Maximum Daily Loads.

Montana currently has over 1,900 public water systems classified as either community, non-transient, or transient. Water from community and non-transient type systems (about 850 total) generates greater exposure for consumers to potential contaminants than does water from transient systems. Therefore, DEQ will develop a source water assessment program that prioritizes implementation based on PWS classification, size, and assumed risk based on known source water characteristics.

Announcing: 1998 1st Annual Montana Water Quality District Mini-Conference

Theme: Understanding the diversity and strengths of Montana's Water Quality Districts

✦✦✦✦✦✦

Sponsored by:

Lewis & Clark County Water Quality Protection District
and
DEQ Pollution Prevention Bureau

✦✦✦✦✦✦

Proposed Agenda:

- Introductions and DEQ Perspective of Water Quality Districts
- 1-hour presentations by Montana's Four Water Quality Districts
- Round Table and/or Panel Discussions

Now we need your input!

What issues are most important to discuss (legislative issues, septic system impacts, state law, concerns WQD's are facing?)

Please call Vivian or Pat with your ideas -- 447-1668 or1659
LET US KNOW WHAT YOU THINK!!

✦✦✦✦✦✦✦✦

Please mark your calendars for:
Friday, April 24, 1998 at the Montana Club
Saturday Morning, April 25, 1998 at the Park Plaza Hotel

If you plan to attend the mini-conference, please RSVP 447-1668; we need a number to arrange for rooms and lunch!

Annual MWEA Biosolids Award

The Montana Water Environment Association (MWEA) Biosolids Committee announces that it will be presenting the 3rd annual Biosolids Award at the 1998 Joint Conference in Kalispell. The award will be given to the community or private facility which epitomizes the responsible and beneficial reuse of municipal or industrial biosolids. The following criteria will be used to rank the nominees and award recipients will receive a plaque to signify their reuse programs excellence.

Beneficial Reuse Biosolids program must include reuse strategy such as land application, composting, land reclamation, etc. Alternatives such as landfilling or surface disposal are not considered beneficial reuse.

Compliant with 40 CFR Part 503 Reuse practices must meet all applicable requirements of the Standards for Use and Disposal of Sewage Sludge (40 CFR 503)

Marketing and Education Program should contain efforts at marketing biosolids and/or efforts to educate the public about biosolids reuse.

Long-Range Planning Biosolids program has considered ways of assuring that reuse alternatives will remain viable in the future, and/or ways of increasing the reuse alternatives available.

Quality Control Program includes methods of assuring that reused biosolids are of good quality.

The MWEA Biosolids Committee welcomes any nominations (including self-nominations) for this award. The committee will be mailing out nomination applications in January or February to all of the municipal programs which exercise beneficial reuse. If you would like to make a nomination or notify the committee members of a particularly noteworthy program, please contact Paul Montgomery @ 449-7913 and we will be sure to include them on the mailing list. This year, we would like to extend a special invitation to all of the facilities which were involved in a one-time application program. These would be such projects as lagoon modifications or rehabilitations. If the sludge (oops, biosolids) went to beneficial reuse, WE WANT TO KNOW ABOUT IT!

Last years award recipients were Glacier Gold for an outstanding commercial composting operation in northwest Montana, and the City of Hamilton for an exemplary municipal composting program. Each year the number of nominations received increases. However, almost half of the biosolids produced in the state goes to the dump. It is the goal of our committee to see the scale tip the other way.

MONTANA OPERATOR CERTIFICATION PROGRAM WINS AWARD

Shirley Quick, DEQ certification officer, accepted the **1998 Association of Boards of Certification (ABC) Certification Program Award** which was presented to the **Montana Water and Wastewater Operator Certification Program**. This award was presented at the eleventh annual ABC conference on January 23, 1998, in Orlando, Florida.

The Certification Program Award is an annual award presented to an ABC member who is a certifying authority in recognition of outstanding contribution toward establishing or advancing certification. ABC is an international association for environmental control certifying authorities.

The nominating criteria for this award are: ❦ The member certifying authority shall have contributed through time and effort; innovative and successful approaches; leadership; development of materials; or a combination of any of these. ❦ The contributions shall be of state/provincial, regional or international scope, and of lasting value in improved performance by more highly qualified personnel and laboratory facilities.

The Montana program was nominated for this award by **Rory T. Schmidt, Montana Rural Water Systems** Program Specialist. The nomination stated: "Montana Rural Water Systems, Inc. has been providing training and technical assistance for over 18 years in Montana; during this time there has been many changes in the recent years as a result of positive direction from the certification office. The state certification office and the certification officer have been a positive force in getting operators certified and on going certification classes for certified operators. Some areas of concern that demonstrate this departments and the certification officers' commitment are as follows:

(1) A yearly (sometimes semi-annual) update on the number of credits earned by each certified operator.

(2) New and updated certification tests and study materials.

(3) A new mid-summer operator certification school for new operators not yet certified; to attend and receive training; with the goal of taking the state certification test for their system's classification.

(4) The creation of a new 'Water/Wastewater' industry certification committee; which as been looking into the possible questions and problems with operator certification and on-going CEC renewal. This committee through the department's and the certification officer's leadership has accomplished many objectives:
   - (a) In-house training CEC criteria
   - (b) Dual CECs
   - (c) ATPs or Approved Training Providers

All of the above objectives are intended to enhance the State of Montana's Operator Certification Program and to build on excellence. Please accept this nomination form for an outstanding program and a very deserving certification officer."

DEQ Enforcement Division Is Alive and Well

Reorganization of the Department of Environmental Quality created the new DEQ Enforcement Division (ENFD). This is the first time the agency has had one team designated for the enforcement of all the public health and environmental laws administered by the department. Enforcement work really began after the hiring of key staff positions such as Frank Gessaman, the Case Management Bureau Chief and Ed Thamke, the Complaints Management Section Head. A report on the number of complaints and cases is listed below to illustrate the accomplishments of the ENFD during 1997.

Formal enforcement actions have been vigorous for violations of the Public Water Supply Law. The Department has administrative penalty authority and therefore DEQ is able to issue administrative orders and assess penalties for violations without going to court. One goal of DEQ is to ensure compliance with all applicable laws and regulations. We hope that through administrative enforcement actions, the Department can address violations early on before they become major violations that need judicial action and large civil penalties.

Several important enforcement "firsts" have been recently accomplished in by the Department. For the first time the Department collected a penalty from a violator who constructed a public water supply system without prior Department review and approval. The Department has also issued the first administrative order for violations of the Water and Wastewater Plant Operator Certification Law. If you have any questions about the Department's Enforcement Division or any of the summary information listed below, please feel free to contact the ENFD at 444-0379.

Analysis of Enforcement Actions by Enforcement Action Type				
Status	**1997 Case Load**	**Enforcement Action Type**		
		Administrative	**Civil**	**Criminal**
Air Quality Act	12	6	6	
Strip and Underground Mine Siting Act	39	25	14	
Hazardous Waste Act	3		3	
Metal Mine Reclamation Act	9	8	1	
Motor Vehicle Recycling & Disposal Act	3		3	
Opencut Mining Act	27	27		
Public Water Supply Act	42	39	3	
Solid Waste Act	3	2	1	
Underground Storage Tank Act	1	1		
Water Quality Act	17	15	1	1*
Total	156**			

*The criminal action was initiated by a county attorney upon the request of the department.

**The totals do not include enforcement actions that were withdrawn.

Technical Assistance is Available!

Having continual or intermittent Bacteriological Problems?

Out of compliance on chemical monitoring because you don't know what to do next?

New operator and need guidance on operation, disinfection or monitoring?

These are common problems experienced occasionally by Montana public drinking water systems. If your having any problems call the Community Services Bureau at 406-444-4400. We will help you get back on track. We can help you troubleshoot any of your system problems, often over the phone.

If for some reason you need on site assistance, we can arrange for a visit by our technical staff or our contracted technical assistance group, South Hills Environmental Management Consultants. These services are free, paid for by your drinking water fee's.

The principals of South Hills offer extensive experience and unique expertise in most areas of operation, maintenance, and water quality sampling of public water systems. They share a sincere commitment to ensure the protection of public health through the provision of safe drinking water in Montana.

Please welcome these people and have confidence that they are at your system to help you solve any problem that you might be experiencing or have previously experienced, with the operation, maintenance, or water sampling of your public water system.

Call today and we'll assist you to ease of operation. The Department of Environmental Quality, Permitting and Compliance Division is eager to help with any of your system problems. Let's all work together for better, safer drinking water.

6th Annual Spring Water School for Small Systems

by: Barb Coffman, METC Training Specialist

The Montana Environmental Training Center (METC) will hold its 6th Annual Spring Water School for Small Systems on March 11 - 13, 1998 at the 4B's Inn and Convention Center (3803 Brooks St.) in Missoula.

The annual two and one half day seminar is designed for both entry-level and experienced water and wastewater operators and managers. Topics and presentations will specifically target SMALL systems, which are class 3, 4, and 5 water operators and class 3 and 4 wastewater operators. This includes operators of Nontransient Noncommunity systems. (Advanced surface water operators and advanced wastewater operators are encouraged to attend other seminars better designed to meet their needs.)

The school will feature an array of topics from wells and lagoons to process control of water treatment facilities and wastewater collection system operation and maintenance. Preventive maintenance, safety, and current regulations are just a few of the topics to be covered.

An American Water Works Association (AWWA) teleconference on Maintaining Water Quality in the Distribution System will be available during Spring Water School on Thursday, March 12, 1998. The three and one half hour teleconference will focus on hands-on practical experience for optimizing water quality in distribution systems, specific techniques for flushing, monitoring, and biofilm control, evaluating disinfection alternatives, and operation and maintenance of water storage facilities.

This school is not to prepare operators for the Certification Exam. However, a Basic Training Track will be offered for those planning to take exams on Saturday, March 14, 1998 following the Spring School. Prior arrangements must be made with the DEQ Certification Office, Shirley Quick, to take any exams on Saturday (406-444 2691). The Basic Training Track is designed to help operators brush up on materials they have been studying for the exams. It will cover math formulas, geometry, hydraulics, loading rates, lagoons and mechanical systems, and concentration and chemical feed problems. PLEASE NOTE: No CECs will be offered for the Basic Training Track.

A block of sleeping rooms for the nights of March 10, 11, 12, and 13 have been reserved at the 4B s Inn and Convention Center. The rate is $41.55 per night for single bed rooms and $51.95 per night for double bed rooms. Call direct to reserve your room, 800-272-9500 or 406-251-2670, and reference Montana Environmental Training Center to receive the special rate. This block of rooms will only be held until two weeks prior to the Spring Water School. Make your reservations early!

Please watch your mail in early February for an METC brochure announcement containing more specific information and a registration form for the Spring Water School or contact METC at 406-454-2728. Hope to see you there!

MWEA President's Message

By Paul W. Montgomery

1997 A.D., a year of pronounced ups and downs. We experienced the thrill of exploring another world, we witnessed the death of a saint. From a record-setting day in August on Wall Street, to its record-setting plunge in October. We saw strange weather, and we saw more strange weather. We saw prominent sports figures munching on other prominent sports figures. On the local front, we saw a change in our paid administrative help for MWEA and MSAWWA. Besides the headlines, what did the year mean to you?

1997 marked the 25th anniversary of the Federal Water Pollution Control Act, otherwise known as the Clean Water Act. Many of us (myself included) draw our existence from this piece of legislation. The fact that many who read the Clearwater are also members of the MWEA further reinforces our commitment to what the CWA intends to accomplish. Swimmable, fishable rivers, lakes and streams is a simple phrase with volumes of hidden meaning. I feel that the MWEA (and WEF) serve a vital function in making that goal reachable, through the dissemination of information, and putting people who need to know in touch with those that do know. Which brings us to the 1998 MWEA/MSAWWA Joint Conference in Kalispell.

The Joint Conference promises to be one of the best, with activities taking place at the Outlaw Inn, May 6-8. The Pre-Conference Seminar will be hosted by MSAWWA this year with the presentations being of benefit to clean and dirty water folks alike. Our organizations have sent emissaries to look at the facilities and they returned with an outstanding report. Lee Leivo with the Bigfork Water and Sewer District, and Joni Emrick with the City of Kalispell have graciously accepted to be Co-chairs of the Host City Committee. With their organizational skills and those of Dean & Carolyn Chaussee (our new administrative help) Im confident that the 98 Conference will be a memorable event.

MWEA continues to enjoy a modicum of financial security through the herculean efforts of Karen Sanchez and the Education Committee. Our hats are off to you for putting together another round of effective Infrastructure Workshops. Hopefully, you will enjoy more freedom to arrange future workshops.

1997 also brought an updated Joint Directory of MWEA and MSAWWA membership. If you have not received a copy or there are needed changes, please let Bill Bahr or Dean Chaussee (Sections Directory Co-chairs) know and it will be fixed.

As I plod through 1998, I am constantly reminded of the need for our organization and the niche we must fill. It is more than building membership or attending a conference. It is the collective voice of Montana's water and wastewater experts which can be used to realize the goals we set with SDWA and CWA. Please involve yourself in MWEA and/or MSAWWA, your organization needs you. Have a happy, healthy and exciting year, and we will see you in Kalispell.

MWEA Director's Report

By Bill Bahr

As MWEA Director to the Board of Directors for the Water Environment Federation, I was privileged to attend the WEFTEC '97 Conference in Chicago in October. My professional position entails working with the cities, towns, communities and other public entities throughout Montana in various ways to assist them with their wastewater treatment systems. Attending the conference allowed me the opportunity to sit in technical sessions related to the very same issues we have here in Montana; nutrient removal in large and small wastewater treatment facilities, cold weather impacts on wastewater treatment, wetlands as treatment options, new pumping station designs and others. Serving as Montana's representative to the Water Environment Federation provided the forum to address topics that guide pollution control efforts around the world as well as in the United States and Montana. This thank you is to the membership of the Montana Water Environment Association for these wonderful experiences. I hope I have served you well.

If this sounds like a farewell to MWEA, it is, sort of. At the annual Joint Conference with MSAWWA in Kalispell in early May, the MWEA members will choose a new Director. The new Director will be sworn in at the WEFTEC '98 Conference in Orlando in October and serve for the following three years. This position is important to both MWEA and WEF. It is important that our Directors serve with distinction and pride in our member association and carry to the federation concerns that we have in our state. Perhaps as importantly, the officers who attend the national conference and the regional networking meetings will make friends that will last most of their professional lives, and perhaps their personal lives as well. We are fortunate in the west to have Hawaii, Alaska, Arizona, New Mexico, Colorado, California, British Columbia, Nevada, Utah, Washington, Idaho, Oregon, Alberta, Wyoming and others to share our experiences with. The regional meetings have been held in some outstanding venues, including, of course, Whitefish, Montana this last spring. Active participation by Montanans in MWEA can yield benefits that far exceed the cost of membership and the effort of individual contributions.

In addition to the wealth our member association brings to the Federation, MWEA provides education and leadership to all Montanans. The joint conference last spring had prime examples of quality technical presentations and cutting edge technology, both serving the people and communities in Montana in addressing their water environment protection needs. MWEA recently hosted a series of day-long seminars designed to help communities provide adequate treatment facilities through infrastructure financing and planning sessions. We contribute to the preparation and distribution of this publication, which reaches nearly all operators and managers in Montana. Please join me in Kalispell this spring as we plan for the future.

Operator Certification: the Past

Thanks, Art Clarkson, for naming the original board and operators in the cover photo of the Fall 1997 issue of the Big Sky Clearwater. Here is another copy of that photo and the individuals represented. Anyone know the names of the two city engineers?

Sitting, in front: Governor Tim Babcock

From left to right: Bob Haverfield, Missoula; Bill Hayes, Pie Mason, Deerlodge; Clay Brinck, State Department of Health; Art Clarkson, state; Jerry Eby, Elk River; Ed Waldo, Billings; John Voelker, Billings; Vern Reed, Livingston; ? (Laurel city engineer); Leonard "Red" Opperud, Havre; ? (Dillon city engineer); Roger Pearce, Dillon; and Frank Taylor, Billings.

...and the Present

This picture was taken of the present **Water and Wastewater Advisory Council** at their September 1997 meeting.

Sitting from left to right: Shirley Quick, certification officer; Bob Cottom, Dillon; Lee Leivo, Bigfork; and Curt Myran, Miles City.

Back row from left to right: Warren Jones, MSU-Bozeman; Steve Ruhd, Conrad; Mike Holzwarth, Colstrip; Jim Melstad, DEQ; and Carol Reifschneider, MSU-Havre.

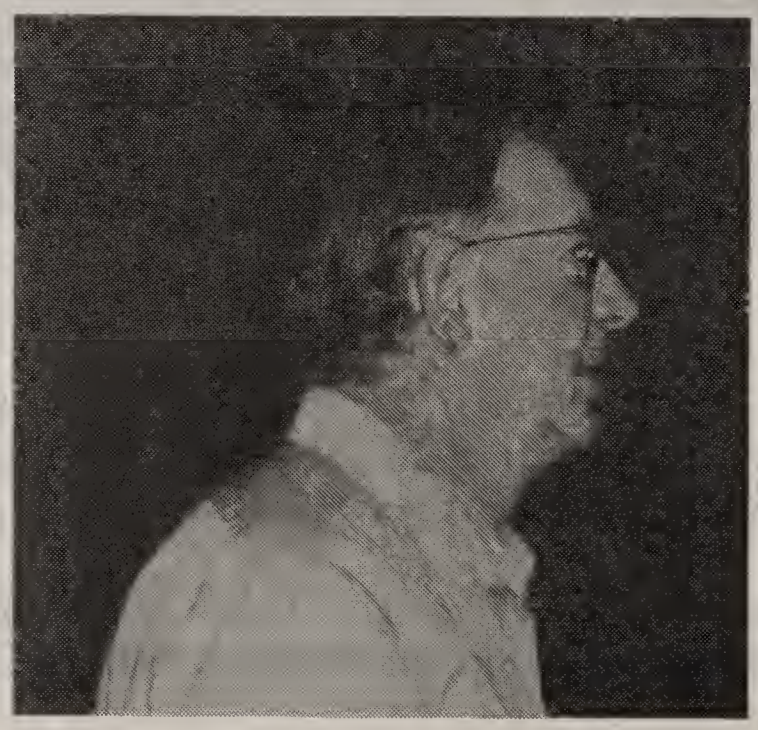
HIGHLIGHTS OF THE 30 YEAR CELEBRATION OF MONTANA OPERATOR CERTIFICATION AT THE FALL WATER SCHOOL IN BOZEMAN

One of the major highlights of the 30-year celebration on Monday morning was the video of **John Voelker**, retired superintendent of the City of Billings water and wastewater treatment plants. Mr. Voelker, with the help of Gary Workman of the City of Billings, put together a video on his experiences in getting the original 1967 legislation passed. In 1965 the Executive Committee of the Montana Section of American Water Works Association and the Water Pollution Control Administration set up a permanent Operator Certification Committee with John Voelker of Billings serving as the chairman. Mr. Voelker pointed out in his video that the original legislation was presented because the operators in the state wanted it, and it only passed because of the pressure the state operators put on their legislators.

Former **Governor Tim Babcock** was present that morning to speak on the history of this bill. The following is a photo of Governor Babcock and Dorothy Bradley, from the Montana Water Center, who introduced him.

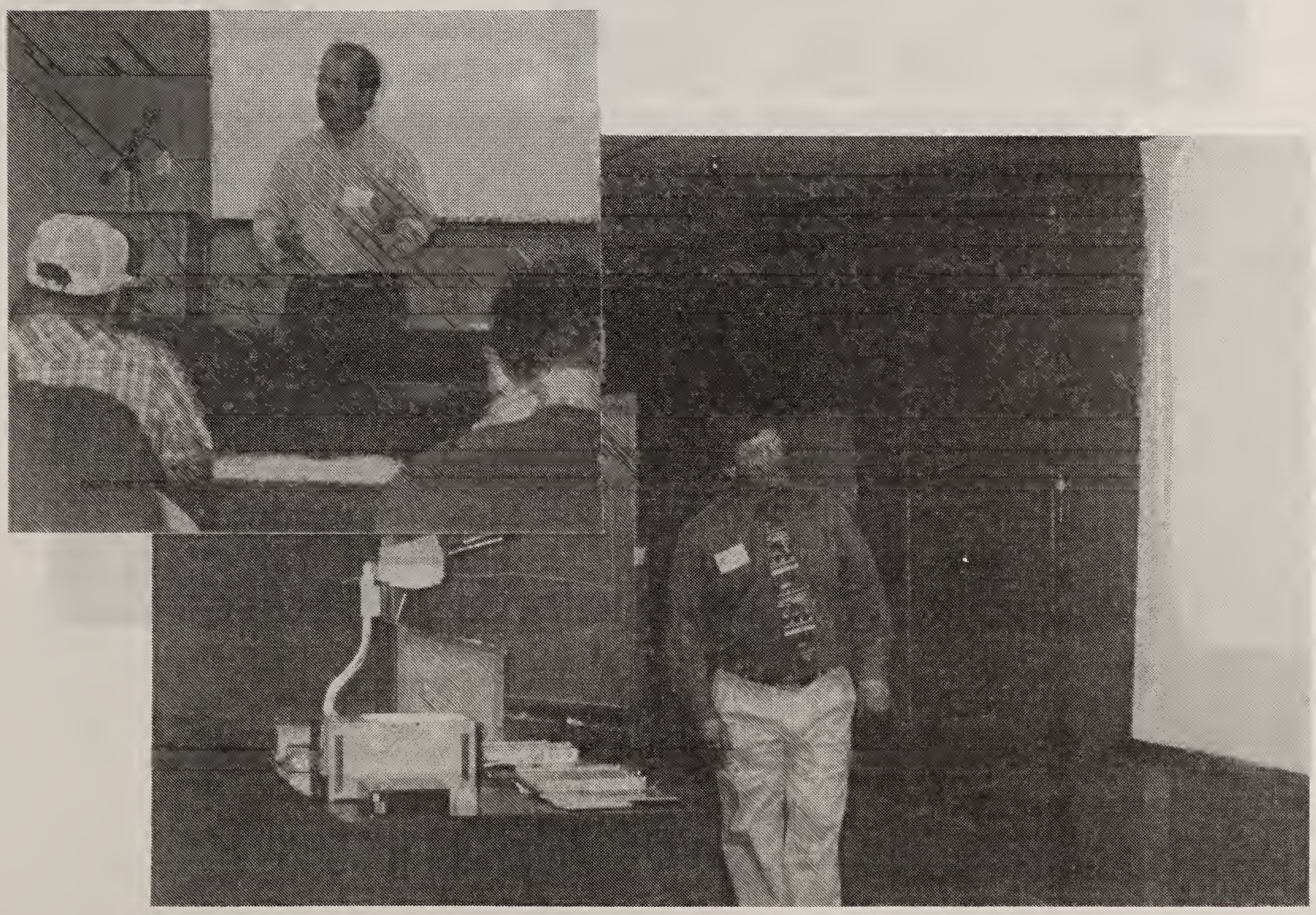
Rosemary Fossum, retired state certification officer, shared her memories of the old days of certification. The following photo shows certification officer, **Shirley Quick**, presenting Rosemary with a plaque to show her appreciation.

There were several "old-timers" in the audience who came to share their recollections of certification in the past. This is a photo of **Mike Thomas**, City of Billings, doing just that.

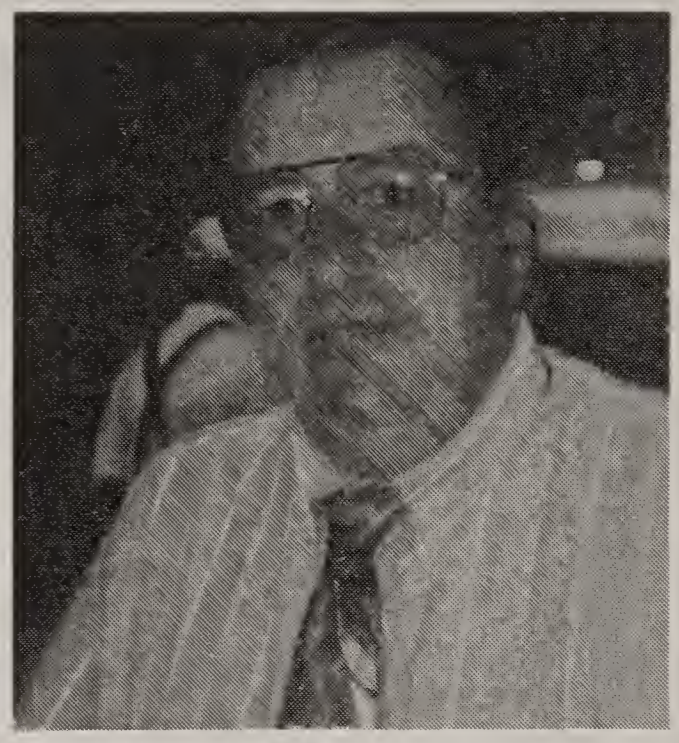


But, as these two photos show, the biggest hits of the morning were the anniversary celebration cakes.

As these photos of **Terry Campbell** and **Bill Bahr** show, when the fun was over, this water school concentrated on learning.



As these photos show, quite a bit of fun was had by all during the vendors show on Monday afternoon.



Good News From The State of Montana Environmental Laboratory!

by
Debra Fulton
Laboratory Manager

As of July 1, 1997, the Environmental Laboratory is once again a stand alone entity which has been elevated to Bureau status. What that means, for all of you non-bureaucratic types, is that the laboratory has greater access to department leaders, and the department has made a real commitment to laboratory development.

We are excited about the changes! The staff of the Environmental Laboratory is busy developing a strategic business plan to better serve your needs. The plan already includes equipment upgrades, decreased turn around times and an increase in consultative services to our customers. We are exploring options for making testing more convenient for water systems such as earlier mailing schedules and the routine mailing of sample bottles for chemistry in addition to those we now send you for water bacteriology.

Bottom Line? We want you to be happy doing business with us! In the coming months, many of you will be receiving a survey from the laboratory requesting your comments on our services. Are we timely and accurate? Do you get your questions answered quickly and thoroughly? Are our costs reasonable? Should we offer additional services? These are just a few of the questions our survey will ask to help us get a better picture of your environmental testing needs. When the survey arrives, please take a few minutes to give us your input. It's important to us so that we can improve our service to you and your water systems!

The state Environmental Laboratory is a full service environmental laboratory certified by the EPA for drinking water testing. We offer timely and cost effective environmental testing and report all regulated test results directly to DEQ to simplify your regulatory requirements. For questions about your particular testing needs, call us at (406)444-2642!

The Board of Environmental Review is proposing to amend rules affecting public water supplies and to adopt a new rule for voluntary cross-connection control programs. Rule amendments are being proposed for four general reasons. First, the 1995 Montana legislature changed the definitions in the law that apply to public water supplies to be more consistent with the federal definitions. Rule changes are being proposed to make the definitions read the same in both the law and rule. Second, the reorganization of state government agencies makes it necessary to change certain names in the rules. For instance, the public water supply rules contain references to the Department of Health and Environmental Sciences, which will be changed to Department of Environmental Quality. Third, it is proposed to change the monitoring frequency for bacteriological samples for transient non-community public water supplies from monthly to quarterly. Fourth, the board is proposing to make additional housekeeping changes to the rules for clarification and to correct typographic and other errors.

The Board is also proposing new rules for voluntary cross-connection control programs. The 1995 legislature required the Board to adopt minimum standards for cross-connection control devices that may be implemented by the owners and operators of public water supply systems who wish to participate in a voluntary cross-connection control program. The standards are intended to ensure that a public water supply does not become contaminated when it is connected to another non-public water supply or other source of contamination.

Rule notices were published in the Montana Administrative Register and copies of the rule notices have been mailed to interested parties that are on DEQ's mailing list. There will be a public hearing on the rules beginning at 1:00 pm on Monday February 23 in the Metcalf Building, 1520 East Sixth Avenue, Helena. Written comments may also be submitted to the Board of Environmental Review, PO Box 200901, Helena, MT 59620-0901. For more information about the public water supply rules contact the Community Services Bureau at 444-4400.

Is Your Pump Happy?

By Robert L Sanks, Professor Emeritus
Montana State University

A happy pump does not cavitate, snore, or excessively vibrate. (All rotating machinery vibrates somewhat). There are no well-developed whirlpools in the water surface above the pump intake. A submersible pump should operate without major repairs (rebuilding or replacement of seals and bearings, for example) for three to five years, and dry pit pumps last longer than that - - occasionally for two decades without major repairs. If your pump is troublesome by comparison, the cause might not be the pump itself but the conditions under which it operates.

One of the most frequent adverse conditions of operation occurs when the design engineer too cautiously assumes the force main to be rougher than it really will be. If the force main is very long, the pump may be selected for a head that is too high. With less pumping resistance than anticipated, the pump discharges more water than it should. Because pumps are designed for balanced hydraulic forces at specific discharge, these forces become unbalanced at other discharges, and the imbalance increases rapidly with the difference between the actual versus the ideal discharge. Thus, excessive discharge causes high radial forces to act against the side of the impeller, and the impeller transfers the load to the shaft, overloads the bearings, and quickly wears the seals and wear plates. Sometimes a shaft is broken.

If you have an unhappy pump and a relatively long force main, it would be wise to test for the proper pumping head. The test is simple in concept. Attach a calibrated pressure gauge to the pump discharge pipe and (for dry pit pumps) another pressure gauge that reads absolute pressure on the pump suction. If possible, mount the gauges three or four pipe diameters from the pump. From the gauge readings and elevation of the gauges, compute the actual head on the pump and compare it with the manufacturer's curves. If the pump is not operating close to the best efficiency point (BEP) trimming the impeller may solve the problem. Or the manufacturer may suggest a different impeller. The BEP is readily shown by the efficiency lines on the manufacturer's curves. It is probably unnecessary to mention that the pumping should be checked for obstructions.

Most engineers can do this kind of work. Bill Bahr at the Department of Environmental Quality (444-5337) can furnish good advice to operators who want to do the work themselves.

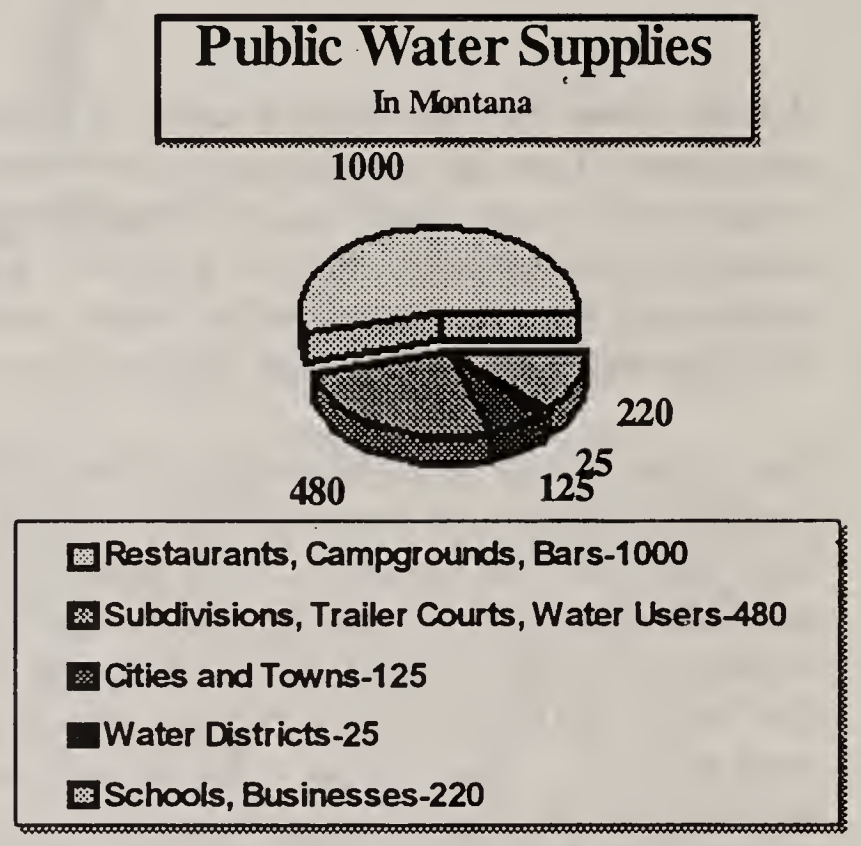
If a test indicates your pump is operating close (within 15%) of the discharge at the BEP and you are still having problems, contact the pump manufacturer's chief engineer and try to find the root cause of the problem. If the pump is shoddy or too light for the service, it is likely to be economical in the long run to replace it.

Community Services Bureau

Public Water Supply Section
Phone 406-444-4400; FAX 444-1374

Public Water Supplies in Montana

The Public Water Supply (PWS) Section regulates all public water suppliers (those serving 15 or more service connections or 25 or more people for at least 60 day of the calendar year) for compliance with the federal Safe Drinking Water Act and the Montana Public Water Supply Law. There are approximately **1850 public water supplies in Montana**. Additionally, the section administers water and wastewater operator certification requirements for **more than 1400 operators**.



Services Provided by the PWS Section

Because federal and state regulations regarding public water supplies have increased dramatically since the 1986 amendment to the Safe Drinking Water Act, the PWS Section provides a variety of services intended to assist all water system owners and operators in achieving compliance.

- **Training** - At least **25 days** of training activities were provided by multiple staff. Over **500 attendees** in 1997. Contacts - Rick Cottingham, John Camden, Terry Campbell, Marc Golz, Shirley Quick.

- **Operator Certification** - The program provides regular assistance to the Operator Certification Program in **training, continuing education and testing requirements** for **more than 1400** certified water and wastewater system operators. Contacts - Shirley Quick or Tom Sanburg.

- **Technical assistance visits** - Approximately **270 visits** were conducted in 1997 to provide direct assistance in **resolving specific compliance problems**. Staff or contractors are **available upon request** to provide you with direct assistance **with any compliance issue**. Contact - Rick Cottingham, John Camden (surface water), Terry Campbell, Craig Pagel, Gary Wiens, Jerry Burns (Billings area).

- **Resolving contamination problems** - Because public health threats may result from contaminated drinking water, considerable resources are devoted to resolving unsatisfactory water sample results that are reported to the program daily. Contacts - all program staff.

- **Groundwater under the influence of surface water** - EPA regulations require assessments of groundwater sources to determine whether surface water negatively impacts water quality. The program provides determinations through a contract with the Montana Bureau of Mines and Geology in Butte. Contact - Marc Golz.

- **Sampling schedules** - Program staff develop and provide **customized sampling schedules** to assist water suppliers in meeting complex federal monitoring requirements. Schedules are **available upon request** (over 400 have been provided to date). Contacts - Craig Pagel, Gary Wiens, Terry Campbell, John Camden, Rick Cottingham.

- **Monitoring waivers** - Program staff have justified and received approval from EPA for permanent statewide monitoring waivers for 8 regulated contaminants. Although most communities are unaware of the waivers, they have **saved** water suppliers **hundreds of thousands of dollars in monitoring costs**. Further monitoring waivers for inorganic and organic chemical contaminants have also been provided by department staff through technical assistance to water suppliers. Contacts - Craig Pagel or Gary Wiens.

- **Wellhead protection** - Assistance in developing a wellhead protection program is provided through department staff and a contract with the Montana Bureau of Mines and Geology. Contact - Joe Meek, Planning & Prevention Division, 444-4806.

- **Inspections** - Program staff and contractors conducted 205 inspections in 1997. Although inspections are technically a routine regulatory requirement, the visits are intended to **provide assistance in identifying and resolving routine compliance questions**. Contacts - Jim Melstad, Terry Campbell, Jerry Burns (Billings).

- **Emergency response and complaint investigation** - Staff are available at any time to respond to emergencies. Most complaint investigations regarding public water supplies are handled by program staff instead of referral to the Enforcement Division. Contacts - all PWS Program staff.
- **Wastewater system operation and maintenance** - Staff from the Technical and Financial Assistance Bureau in the Planning, Prevention and Assistance Division are available for training and technical assistance. Contact - Bill Bahr, 444-5337.

- **Coordination with funding agencies** - We participate in WA2SACT, the ad-hoc organization of Montana funding agencies, to identify funding needs. Although water and wastewater improvements can be very expensive, regulatory mandates often enhance funding opportunities for Montana communities. Program staff recognize the need for coordination and careful planning. Contacts - Jim Melstad and Marc Golz.

Following this article is a complete list of phone numbers for all DEQ staff. Phone numbers for staff in the Public Water Supply Section are listed under the Community Services Bureau on the second page.
PLEASE CALL US IF YOU HAVE QUESTIONS OR IF YOU SHOULD NEED ASSISTANCE.

Jim Melstad, Supervisor
Public Water Supply Section
ph. 444-5315

Waterborne Pathogens: What Is the Best Approach to Prevention?

This article is an updated version of one printed in the National Drinking Water Clearinghouse's "On Tap" Winter 1996 issue.

Although it seems like last week, it was more than 20 years ago that I began working for the Montana Department of Health and Environmental Sciences as a sanitary engineer in the Public Water Supply Program. Much has happened in the intervening years: I've learned a lot, and so has the entire water industry. Of particular interest is what we have learned regarding the relative risks that various contaminants pose to the public health.

How safe is surface water?

I think back to the early 1980's when sanitary surveys, along with occasional waterborne outbreaks of giardiasis, convinced me that Montana's most significant drinking water health risks were from surface water sources serving small water systems, both filtered and unfiltered.

We were learning that high numbers of pathogens are likely to be found on occasion in all surface waters, even those we label as "pristine." We tried monitoring the raw water for *Giardia* cysts in an effort to get a handle on the extent of the risks and determined monitoring just wasn't very effective.

When we found cysts, no one knew how to quantify the risks and, even more disturbing, we had waterborne disease outbreaks of giardiasis when we were unable to find cysts. Ultimately, our conclusion was that effective treatment had to be in place 100% of the time to ensure safe drinking water during those sporadic events when pathogens are present (e.g., during runoff events or when Mr. and Mrs. Beaver set up housekeeping near the intake). That is to say, surface water sources must have sufficient treatment and disinfection capabilities to remove and/or inactivate pathogens that may occur in the raw water.

Based upon my experience, I had some difficulties enthusiastically endorsing all of the requirements of the Safe Drinking Water Act (SDWA) Amendments of 1986. The provisions of the act seemed to direct too many of our scarce resources toward addressing contaminants of lesser concern than waterborne disease: contaminants rarely found in drinking water and which, when present, have health impacts only when consumed over long periods of time. (e.g., SOCs and VOCs.)

Are waterborne pathogens a problem?

I remember attending a meeting about nine years ago when representatives of the U.S. Environmental Protection Agency (EPA) in Washington, D.C. Individuals from approximately a dozen states attended, and each state was represented by its drinking water administrator and the director, secretary, or commissioner of the department in which the Public Water Supply Supervision Program was located.

We were there to whine (something in which I have some expertise) about the EPA's demands on the time and resources of state programs. During our whinefest I was surprised to hear a couple of states' directors characterize the Surface Water Treatment Rule (SWTR) as a poor use of time and money. One stated that "we [the states] took care of those kinds of problems decades ago."

My director and I were sure we could not make such claims about Montana. We were also convinced that simply having treatment in place did not necessarily mean that the public health problems were solved.

New SDWA Reflects Our Experience

Those experiences occurred only a few years ago but consider what has happened since. First, we have had another reauthorization of the SDWA that is reflective of many of the things we have learned since the 1986 amendments were enacted. Research and experience — sometimes bitter experience — have greatly expanded our horizons.

Some of the things we've learned include the following:

- The risk of waterborne disease is still very much with us.
- Such problems are not limited to small water systems or to any particular state or region.
- Having a surface water treatment plant in place does not necessarily ensure safe water.
- Compliance with the SWTR provides no guarantee that outbreaks of waterborne disease will not occur.
- *Cryptosporidium*, the latest "bug of the month," is not inactivated by common disinfection techniques.
- Many operators and managers of surface water treatment plants are not fully aware of relationships between plant performance and public health.
- Consumers have, to some degree, lost their confidence that drinking water from our public water supplies is unquestionably safe.
- Operators of surface water systems must find new and innovative ways of minimizing risks from pathogens and providing the quality of water customers expect and deserve.

Where do we go from here?

Assuming we generally agree the above statements are correct, what is needed for surface water treatment plant operators to conquer these challenges? Will huge sums of money have to be raised to pay for the capital improvements necessary to achieve the required level of performance? Will new technologies have to be developed to ensure reasonably safe drinking water?

I believe that, in the majority of cases, the news is relatively good. To conquer the new challenges, the most important thing we need is an **attitude adjustment**. In other words, we have to establish a radically different concept of what is acceptable and necessary for safe drinking water.

We must establish new and higher goals for finished water quality and, finally, we must come to terms with the fact that we cannot accept anything less than full achievement of those goals.

After developing this kind of commitment to high quality drinking water, we must look at the process of water production from beginning to end in order to determine what modifications and changes may be in order.

Start at the source

The first step is to look upstream. Watershed protection, one of the first tools developed by public water supplies, was, and is, effective. However, the complacency we've developed over the past several decades too often has led us away from vigilant protection of our source water quality. It is true today, as much as it was 100 years ago, that keeping contaminants--including pathogens--out of the source water will consequently reduce risks to the consumer. Everyone, it seems, has recognized that it is time to go back to basics.

Clean Water Act programs, for example, are emphasizing the watershed protection approach. Also, the newly reauthorized SDWA places emphasis on "source water protection."

Water suppliers can't afford to be left behind. Where possible, they must take the lead, involve other stakeholders, and strive to make sure their source water is properly managed and protected. Watershed protection can, and should be, an effective barrier to pathogens.

Plant Optimization Is Next Step

The next steps involve making sure your facility is doing the best job it possibly can. Assuming the facility has been designed to properly treat the raw water, you must establish new goals for the unit processes--goals that make each major unit process serve as a barrier to the passage of pathogens.

(Some plants may not be capable of achieving the goals of "optimization" without major capital improvements. Your state's primacy agency can advise you in determining if your plant is capable.)

The goals established through development of EPA's Composite Correction Program are very effective in providing high quality finished water, and they are generally achievable. The goals include:

- consistent settled water of 2.0 nephelometric turbidity units (NTU) or less;
- consistent effluent from each filter of 0.1 NTU or less;
- an after-backwash rise in turbidity of 0.2 NTU for 10 minutes or less; and
- achievement of SWTR disinfection requirements.

These are very different from the compliance requirements of the SWTR, as well they should be. They represent true "goals" in that this may be about the best finished water many plants are able to produce, thus, optimization.

The compliance requirements of the SWTR, on the other hand, represent a line in the sand you can't cross without getting yourself in trouble with the law. It is important to be legal, but we certainly should aspire to higher levels of achievement than simple compliance with minimum state or federal regulatory requirements.

What's essential for plant performance?

Some things that are essential for optimization of your plant's performance are:

1. Properly designed treatment facilities;
2. Trained and competent operators dedicated to the production of high quality drinking water;
3. Continuous monitoring turbidimeters, with recorders, on the effluent of each filter;
4. Monitoring of settled water quality;
5. Implementation of a comprehensive coagulation control program, including process control testing, and use of those results, along with the understanding of water treatment concepts, to make process control adjustments; and
6. Support from management to provide the required resources, and to empower the staff to make necessary changes.

It is also essential to pay close attention to filter backwash procedures and timing, backwash water recycling procedures (when practiced), rates of production, flow rate changes, and a host of other factors that can impact plant performance.

Optimization Is a Lengthy Process

Achievement of plant optimization is a long-term process. Onsite and hands-on training is usually required. The plant's staff must learn problem-solving skills and gain experience in responding to changes in raw water quality. Technical assistance is often necessary and is usually well worth its cost in terms of finding non-construction alternatives to ensure safe drinking water.

It's true that we have gained many insights over the past few years and that water being provided form the nation's public water supplies is generally safer that it was just a decade ago. It is just as true that we can't afford to again become complacent.

We must continue to strive to provide the public with the safest and highest quality drinking water possible at a reasonable cost. These are the challenges that make the drinking water profession so interesting and rewarding.

For more information on plant optimization, order a free copy of *Optimizing Water Treatment Plant Performance Using the Composite Correction Program* from the EPA. Call (513) 569-7562 and request #625/6-91/027.

Teleconference on Water Distribution Systems

On March 12, 1998, the Montana Section AWWA will sponsor six downlink sites for the next AWWA teleconference, *"Maintaining Water Quality in the Distribution System."* You can attend in Billings, Bozeman, Butte, Helena, Havre, or Missoula.

Distribution systems don't usually get the attention or resources they deserve, but they are often the source of the biggest water quality problems. This teleconference promises to be of interest to many Montana water system operators and managers. Key areas to be addressed include:

- How changes in the treatment process affect the distribution system
- Strategies for developing a thorough water quality monitoring program
- Biofilms
- Optimizing disinfection, how to do it, and what problems to avoid
- Developing a successful unidirectional flushing program
- Current and proposed regulatory compliance issues

Some of the country's top experts --- operators, industry consultants and researchers, will participate to bring you the latest information on these topics. Don't miss this exciting teleconference on March 12th. MSAWWA members will soon be receiving a flyer listing all Montana downlink sites.

For further information, contact Dean Chaussee at (406) 443-5388.

Location	Coordinator	Phone number
Billings Billings Career Center 3723 Central	Gary Workman Billings Public Utilities P.O. Box 30958 Billings, MT 59111	(406) 247-8513 (406) 657-8319 Fax
Bozeman (New site) Water Center - MSU Huffman Bldg. 7th & Kagy	Dorothy Bradley, Director Water Center MSU Huffman Building Bozeman, MT 59717-0368	(406) 994-6690 (406) 994-1774 Fax e-mail: awrdb@gemini. oscs.montana.edu
Havre MSU- Northern Hagner Science Center	Shelley Nolan City of Havre Box 1608 Havre, MT 59501	(406) 265-5215 (406) 265-2861 Fax
Butte Montana Power Company 40 E. Broadway	Jean Pentecost Butte Silver Bow Water 124 W. Granite Butte, MT 59701	(406) 782-2311 (406) 782-8764 Fax e-mail: daschultz@ in-tch.com
Helena Office of Public Instruction (OPI) 1227 11th Ave	Sandi Ewing Dept. Of Environ. Quality P.O. Box 200901 Helena, Montana 59620-0901	(406) 444-5314 (406) 444-1374 Fax e-mail: sewing@mt.gov
Missoula Missoula County Public School Adult Education Building 901 South Sixth West	Bob Ward Mountain Water Company 1345 West Broadway Missoula, MT 59802	(406) 721-5570 (406) 523-5090 Fax e-mail: bobw@ mtnwater.com

1998 Is The Last Year of Phase II/V Compliance Period!
Every Public Water Supply Entry Point Must Be Tested!
Sample Early in 1998!

The three-year compliance period for the Phase II and V chemicals ends December 31, 1998. If you haven't already completed this sampling, you should plan to do it early in 1998 before laboratories are swamped with requests. Remember that each entry point must be tested separately (purchased water systems need not be sampled since the original supplier tests the water delivered to the purchasing system). Also, systems with trigger level exceedances, previous organic chemical detects or populations of 10,000 or more have additional requirements. The three major groups of Phase II and V chemicals are the inorganic chemicals (IOCs), the volatile organic chemicals (VOCs) and the synthetic organic chemicals (SOCs).

INORGANIC CHEMICALS: Surface water entry points must be tested annually for the IOCs. Groundwater entry points must be tested once in every three-year compliance period. Check your records -- if your groundwater entry points have not been tested since December 31, 1995, you must complete these tests by the end of 1998.

VOLATILE ORGANIC CHEMICALS: Most systems are testing VOCs annually during this compliance period, with the exception of new groundwater sources and those with VOC detects in the past. If you are not sure of your VOC requirements, please call the Public Water Supply Program staff and ask! It is important to complete the third year of annual VOC monitoring as groundwater entry points without previous detects may then qualify for a reduction to sampling once every three years.

SYNTHETIC ORGANIC CHEMICALS: This is the most expensive group to test. Most systems have not done these tests since 1993. Check your records -- if you haven't tested since December 31, 1995, you must complete these tests by the end of 1998. Call your laboratory to request bottles.

When sending samples to a laboratory or mailing results to the Department of Environmental Quality (DEQ), please include the name and identification number of your public water supply system to ensure that results will be properly credited. If you use a private laboratory, the results will not be sent directly to the Department. Mail a copy of sampling results to the following address:

Department of Environmental Quality
Public Water Supply Program
P.O. Box 200901
Helena, MT 59620-0901

Remember that unless your system is a transient public water supply, you are required to have a certified operator (see the article on operator certification in this issue). The certified operator is the person responsible for making sure that all monitoring is done correctly. The certified operator should keep track of all monitoring requirements. Don't rely on DEQ or laboratory personnel to notify you when samples are due! It is the certified operator's responsibility to understand the monitoring requirements for a water system and to ensure that all samples are collected properly, submitted to a certified laboratory and reported to the Department of Environmental Quality.

If you have any questions on entry points or Phase II and V chemical sampling requirements, please write to us at the address above or telephone Craig Pagel at (406) 444-5313 or Gary Wiens at (406) 444-5318.

MONTANA UNIVERSITY SYSTEM WATER CENTER

1998 Alert

MONTANA WATER

The Water Center invites EVERYONE to hook up to our new Web presentation -- *MONTANA WATER.* Thanks to a grant, sponsored by Senator Conrad Burns, and secured with the assistance of Bill Engle (EPA, Helena), we are putting in place our two-year-old dream of a "switchboard" service that will be helpful and interesting to all kinds of "Montana water people." While it is designed to be a useful interface between the university system and the rest of Montana, we are determined that this be a **people's** page that will be expanded and modified according to your feedback and needs.

Some components of this service include the following:

Information

- *Calendar* -- List your conferences here!
- *Directories* -- Do you want to be included?
- *Grant opportunities* -- Something might be available for you!
- *Water Manuals* -- Here is a convenient compilation of Montana water quality and water rights.
- *Jobs* -- Check for water-related jobs in Montana.

Partnerships

- *Drinking Water Assistance Program* -- Are you interested in being part of a team that demonstrates promising (and low cost) drinking water technologies?
- *Whirling Disease Initiative* -- Here is a "problem-solving partnership" at its best!

Policy

- *Mixing zones* -- Have you ever wondered where they are and who they are associated with?
- *TMDLs* --Do you know what they are?

Education

- *Drinking Water Assistance Program* -- Do you want to actually have fun while you are pursuing your continuing education operator credits?
- *Undergraduate Scholars Program* -- Do you want some help from an energetic student?

Watersheds

- *Watershed Cache* – Information on local groups, activities, technical and financial assistance, links, and interactive maps, are all included.

If your computer does not have access to the World Wide Web, you can probably get access (and a quick lesson) at your public library or County Extension Office.

One other thought -- besides visiting us in cyberspace, come visit us live on the southern edge of the MSU-Bozeman campus. Among other services we provide are quick and easy lessons on WEB surfing and a good cup of coffee.

Sincerely,

Dorothy Bradley, Director

TECHNOLOGY TESTING

Another important activity sponsored by the Water Center is the testing of new methods for drinking water treatment. This is the backbone of our *Drinking Water Assistance Program*, about to begin its fourth year. This program concentrates on testing techniques that have proved successful in other areas, but are not yet widely used to treat drinking water. Examples of projects now underway:

- Three corrosion control strategies for public water systems in Florence
- Electrochemical nitrate removal, being tested at Coffee Creek and Rapelje
- Iron and manganese removal by mixed oxidants, being tested at Saddle Mountain and Moore

In these projects, university engineers and scientists work with the private technology developer, the DEQ, and one or more public water systems, to test the method at full scale.

We are always looking for new ideas, and systems where they can be tested. Please give us a holler if you'd like to participate, or could use copies of the program flier or summaries of completed projects!

Sincerely,
Gretchen Rupp, Program Engineer

INTERACTIVE OPERATOR TRAINING

We are up to our eyeballs designing Web and CD-ROM-based modules that will provide convenient and exciting ways to learn and maintain professional education requirements. Organized around the content of the *Ground Water Manual for Small Public Water Systems* and *Montana Source Water Protection Technical Guidance Manual* (provided with particular assistance from South Hills Environmental Consultants, DEQ, and the Bureau of Mines), the initial modules focus on certification training and source water protection. The interactive exercises include sound, video, illustrations, animations, virtual reality displays, and quizzes.

This training tool provides more than general knowledge. It provides all the materials necessary to properly perform your job, such as forms, guides, regulations, documents, and contacts.

One of the particularly special things about this system of training is the option it provides for learning-where-you-live. Even if you don't have your own computer and access to the World Wide Web, our recent survey indicates that you can probably find the right capabilities at your library, County Extension Office, or a school.

We are also planning some outreach opportunities to learn the system, not to mention, providing another hands-on session at Water School. We'll keep you posted!

Sincerely,
Kevin Kundert, Training Developer

The Use of Ground Water Sensitivity Assessments for Purposes of the Ground Water Disinfection Rule

"Sensitivity assessments can be completed to determine if a natural hydrogeological barrier exists that will reduce or prevent contamination of a public water supply well."

Introduction

In developing the Ground Water Disinfection Rule (GWDR), the U.S. Environmental Protection Agency (EPA) considering the use of aquifer/groundwater sensitivity assessments as an element of the overall vulnerability assessment of a public ground water supply well to contamination by infective microorganisms. Sensitivity assessments can be completed to determine if a natural hydrogeologic barrier exists that will reduce or prevent contamination of a public water supply well. If an effective barrier exists and the well or well field is determined to have a low vulnerability to contamination by infective microorganisms (based on low sensitivity, adequate management of microbial sources, and adequate integrity of the wellhead and distribution system), a public water supply system may be able to avoid disinfection of the ground water supply as part of this proposed draft regulation's implementation.

In recent years, contamination of public water supplies by infective microorganisms has resulted in thousands of illnesses. In response to this, the EPA (as mandated by the Safe Drinking Water Act) is required to promulgate disinfection requirements, as necessary, for all public water supply systems. In June of 1989, the EPA issued disinfection requirements for public surface water systems and for public ground water systems under the direct influence of surface water. Since 1989, the agency has been developing the GWDR which will set forth disinfection requirements for public water systems that use ground water not under the direct influence of surface water. The purpose of the GWDR is to protect the health of persons served by public ground water systems by minimizing exposure to infective microorganisms. Microorganisms being considered in the GWDR development include:

Bacteria - Clostridium, Shigella, Campylobacter, Yersinnia, Cholera, Salmonella

Protozoa - Giardia, Cryptosporidium

Virus - Norwalk, Polio, Echo, Rota, Heptatitis A, Coxsackie, Coliphage

Several statistics may be useful to put the development of this regulation in context. About 85 percent (48,000) of the community water systems in the United States are ground water systems. Approximately 95 percent of these systems serve less than 10,000 people and approximately 70 percent serve less than 500 people. Additionally, an estimated 120,000 non-community systems (predominately supplied by ground water) would be subject to this regulation. Four percent of the public ground water systems in the country account for more than 90 percent of all drinking water MCL (maximum contaminant levels) violations in 1995. Fifty-eight percent of waterborne disease (chemical and microbial) outbreaks from 1971 to 1994

occurred in ground watery systems. This includes source contamination and treatment and distribution failures.

The EPA is considering the use of a multiple barrier approach to ensure protection of public ground water supplies from infective microorganisms, with an emphasis on preventing contamination.

Proposed barriers which may be appropriate include protection of the ground water source; protection of the wellhead and distribution system integrity; and protection by disinfection. The multiple barrier approach is being considered, in part, to ensure public health protection without imposing mandatory disinfection requirements on all public ground water systems. In order to ensure that the ground water source is adequately protected, it will be necessary to complete an assessment of the vulnerability of a public ground water system to contamination by infective microorganisms, including an assessment of ground water sensitivity.

A determination of vulnerability will be necessary to answer the question: "How likely is it that the ground water at the well will be contaminated by infective microorganisms?" Aquifer/ground water vulnerability is defined as "the relative ease with which a contaminant (infective microorganisms, in this case) applied at or near the land surface can migrate to the aquifer or wellhead of interest under a given set of contaminant source management practices, well construction characteristics, and ground water sensitivity conditions." Aquifer/ground water sensitivity is defined as "the relative ease with which a contaminant located at or near the land surface can migrate to the aquifer or wellhead of interest." Sensitivity is primarily a function of intrinsic hydrogeologic characteristics of the aquifer, any overlying saturated materials, and the overlying unsaturated zone. If that portion of the aquifer used to supply a municipal well is determined to have a low sensitivity (i.e., be protected by natural hydro geologic conditions), and if the public water supply has adequate contaminant source management practices in place and can assure wellhead and distribution system integrity, the system would be considered to have a low vulnerability and may be able to avoid disinfection.

Hydrogeologic Considerations

An adequate ground water sensitivity assessment is dependent on several considerations. The most important is a sound understanding the hydrogeologic setting. This requires that a firm geologic foundation be established which delineates the three-dimensional distribution of all geologic materials, including aquifers, confining units, and the unsaturated zone. A convenient scale for hydrogeologic mapping is 1:24,000(1 inch = 2.5 miles), the scale of commonly available topographic maps. Unfortunately, in many states, geologic mapping has not been completed on much, or even most, of the lands within the state. The Geologic Mapping Act was passed in 1992 to expedite the production of 1:24,000 geologic mapping with the specific intent to address issues related to land use, ground water management, and environmental protection. However, there are many existing large and small-scale maps that depict traditional geologic information which would be interpreted for purposes of determining aquifer sensitivity or, at the very least, used as preliminary screening and evaluation tool to assess the regional hydro geologic setting of a well or wellfield.

Once the basic hydro geologic framework has been established, evaluations can be made regarding the ability of an aquifer or flow systems to transmit and/or restrict the movement of contaminants (sensitivity). For purposes of the GWDR, aquifer/ground water sensitivity is a measure of the natural ability of geologic materials and/or hydraulic conditions to reduce or prevent the movement of infective microorganisms to a public water supply well. Inherent properties of a hydrogeologic setting (i.e., lithology stratigraphy, structure of the geologic materials; hydraulic properties of the

aquifer and unsaturated zone and the geochemistry of the ground water) may provide a barrier which reduces or prevents infective microorganisms from entering a public water supply well. Hydrogeologic conditions which may impede transport of microorganisms in the subsurface include, but are not limited to, thick vadose zone, thick confining zones above the aquifer in use, or thick clayey soils that slow migration in the subsurface. The lower the sensitivity, the less the likelihood that pathogen contamination of the public water supply well will occur.

In addition, estimated ground water travel times can be calculated for specific aquifers or flow systems and compared to the time period during which pathogens are estimated to remain at viable levels in ground water.

Another option being considered by EPA in addition to the assessment of aquifer/ground water sensitivity is the use of a time-of-travel zone to establish a protective ground water source barrier. Ground water protection zones based on time of travel are commonly used by local governments to protect public ground water supplies from chemical contaminants. These zones are commonly established under local and state wellhead or source water protection programs. However, the accuracy of these areas in terms of size and orientation varies significantly and as a result may not provide an adequate barrier.

Assessment of Aquifer/Ground Water Sensitivity

Many methods for assessing aquifer sensitivity have been developed during the past several decades. It may be possible to use an existing map or study to determine aquifer/ground water sensitivity for purposes of the GWDR. One option being considered is that of an existing map or study of aquifer/ ground water sensitivity meets the following criteria, the map be used to determine aquifer/ground water sensitivity for the purposes of the GWDR:

1. It must address the aquifer used by the public water supply well.
2. The method used to assess sensitivity must be applicable to the hydrogeologic setting in which the public water supply well or wellfield is located.
3. It must present a three-dimensional depiction of the presence, lateral distribution, and thickness of the aquifer supplying the public water supply well and the geologic materials overlying the aquifer. It would be most useful if the map could also show variations of hydraulic properties (which may affect rates of travel of pathogens) for aquifers and confining units; however; this information is often difficult to obtain.
4. It must be at a scale that is not any small than 1:100,000, (1 inch equals approximately 1.6 miles). If maps of smaller scale are used, they must be supplemented with more detailed hydrogeologic information.
5. It must include all geologic materials between the land surface and the top of the aquifer used by the public water supply well.
6. It must include a detailed description of the basic information used to construct the three-dimensional maps that are interpreted for the sensitivity assessment as well as the methodology (e.g., ranking system) for the actual sensitivity assessment.

Because the existing aquifer sensitivity assessments may not be available for most regions of the country, the EPA is considering the use of the following methodology for assessing aquifer/ground water sensitivity where such assessments have not been completed or are inadequate. The methodology was developed by an ad hoc work group that included hydrogeologists from the EPA, the U.S. Geological Survey (USGS), and several states. The assessment methodology is illustrated as a flowchart in Figure d. The three major hydrogeologic factors to be considered include: (1) the presence and effectiveness of a confining layer above the aquifer; (2)the geologic materials making up the aquifer and

the vadose zone above the aquifer; and (3) the depth to the water table or potentiometer surface. An evaluation of these parameters should lead to a determination of low or high sensitivity or to a determination of unknown sensitivity due to insufficient data.

Confined aquifers -- The first step in assessing sensitivity is to determine if an effective confining layer is present. The following criteria are suggested for determining if there is an "effective confining layer" present above the top of the aquifer:

- A minimum thickness of 30 feet for a confining layer recognized by state or federal geologic or water resource agency;
- A vertical hydraulic conductivity of 10 (-6) cm/sec or less for the confining layer as determined by an aquifer test of sufficient duration to provide meaningful data or from an existing hydrogeologic report that can be referenced and provided
- A storativity value for the sources aquifer of 0.005 or less as determined by an aquifer test of sufficient duration to provide meaningful data or from an existing hydrogeologic report that can be referenced and provided
- A minimum head difference of 10 feet between the source aquifer and an overlying aquifer thought to be hydraulically separated by a confining layer
- A significant difference in water chemistry between the source aquifer and an overlying aquifer above a confining layer. Chemical attributes of ground water recognized under this criterion include anions, cations, pH, redox potential, temperature, total dissolved solids, conductivity, and dissolved oxygen.

If the aforementioned criteria are met, the aquifer may be considered to have a low sensitivity. If such conditions do not exist, a sufficient confining layer is absent and further assessment can be done to determine if the aquifer meets the criteria for low sensitivity in unconfined conditions.

Unconfined aquifers--For the purposes of the GWDR, an aquifer which is not overlain by a confining layer is considered to be an unconfined aquifer. Unconfined aquifers are typically more sensitive to contamination than confined aquifers. However, the absence of a geological confining layer does not automatically mean that the aquifer is highly sensitive. In some hydrogeologic settings unconfined aquifers can exhibit low sensitivity and a barrier to microbial movement may exist. A combination of conditions must exist to demonstrate that the aquifer has a low sensitivity and a natural barrier to contamination exists. These conditions include the following:

- A minimum depth to the water table of 100 feet for aquifers which exhibit porous medial flow. This would include areas of thick sand and gravel deposits or other unconsolidated materials, as well as consolidate sediments (e.g., sandstones). For fractured rock aquifers or those which exhibit conduit flow, the minimum depth to the saturated zone should be greater than for porous media flow
- The presence of lower permeability geologic materials in the vadose zone. Layers of fine-grained materials that do not meet established criteria for a confining layer may still retard movement of infective microorganisms, especially if multiple layers exist.
- A low rate of recharge to the aquifer (such as in an arid or semi-arid climate). For the purposes of the GWDR, a low rate of recharge is a time period longer than the viability of infective microorganisms in ground water.

All three of these conditions would need to be met for surficial unconfined aquifer to be considered to have a low sensitivity. If the

criteria for confined and unconfined aquifers are not met, the aquifer should be considered to have a high sensitivity for the purposes of the GWDR.

Hydrogeologic Settings/Aquifers Which Are Almost Certain to Have High Sensitivity

The ad hoc work group was in general agreement that certain hydrogeologic settings do not have much likelihood of preventing the movement of infective microorganisms from a source to a public water supply. In some settings the aquifer or ground water is so highly sensitive that overall risk or vulnerability will also be high even if there are no contaminant sources within the area assessed. The following hydrogeologic settings should be considered to have a high sensitivity unless site-specific detailed hydrogeologic studies prove otherwise:

- Near Surface karstic bedrock Carbonate bedrock such as limestone and dolostone which occurs at or near the land surface frequently exhibits solution weathering and ground water flow occurs along solution enlarged joint sets and fracture systems. Ground water carrying infective microorganisms may move as rapidly as several miles per day. As a result, there is little ability for microbial attenuation. The ad hock work group recommends that the definition of near surface karstic bedrock include areas where solution weathered carbonate bedrock occurs within 50 feet of the land surface.
- Fractured bedrock exposed at the land surface. The movement of infiltrating water in fractured rocks is likely to be much faster along joint sets or fractures than through the pore spaces between sediments. As such, the ability of fractured rock aquifers to attenuate microorganisms is likely to be much lower than porous media aquifers. In mountainous areas of the northeast and western parts of the country, these types of aquifers are commonly used. If the fractured bedrock aquifer is at the surface, this type of hydrogeologic setting is almost certain to have high sensitivity.
- Any highly permeable surficial aquifer which exhibits porous media flow and where the seasonally high water table is near the land surface. In these hydrogeologic settings, there is a high probability that infective microorganisms will quickly move to the water table and enter the zone of contribution of the public water supply well.

These hydrogeologic settings are considered highly sensitive and, as a result, vulnerable to infective microorganism sources. However, it is recognized that under select conditions, considering specific requirements included in other parts of the GWDR, it may not be necessary to disinfect water from public supply wells completed in these hydrogeologic settings. These conditions include the following:

- Detections of infective microorganisms have not been made.
- Effective management of existing and proposed sources of infective microorganisms is demonstrated.

Public input Needed

The EPA is interested in input from the public on this regulatory approach to drinking water protection and disinfection of public ground water supplies. The perspectives of ground water scientists and engineers would be particularly useful. Comments can be sent to Dan Olson, Ground-Water Disinfection Rule Team, U.S. EPA (4607), 401 M St.. SW, Washington, DC 20460 or by e-mail to olson.daniel@epamail.epa.gov or wireman.mike@epamail.epa.gov. Comments will much be appreciated.

CSU Office of Water Programs

6000 J Street ● Sacramento, CA 95819-6025 ● (916)278-6142 ● Fax: (916)278-5959

TRAINING PROGRAM

UTILITY MANAGEMENT
Available April 1, 1998

UTILITY MANAGEMENT is the title of the newest training course now being offered by the Office of Water Programs at California State University, Sacramento. The course is prepared for persons working to advance or become better in the areas of supervision and management.

This training course offers detailed information regarding all the major areas of responsibility of a utility manager. The course covers how key job elements, such as planning, organizing and record keeping, are critical to virtually all aspects of utility management. Practical, up-to-date staffing guidelines presented in this course reflect widely accepted management practices for interviewing, hiring, supervising, and disciplining employees. Legal requirements of recent federal legislation such as the Americans With Disabilities Act (ADA) are discussed, as is the importance of developing policies and procedures for dealing with harassment, grievances, and violence in the workplace. In addition, this training program highlights the essential elements of effective oral and written communications, including formal and informal public relations programs. A major segment of this course focuses on the financial management of a utility. Topics discussed in this segment include assessing the financial strength and stability of the utility, budgeting, and funding capital improvements.

The training manual on UTILITY MANAGEMENT is available for $10.00 plus $0.73 California residents sales tax. Persons wishing to enroll in the home study (correspondence) course must pay an additional $10.00 enrollment fee. For additional information, please contact the Office of Water Programs, California State University, Sacramento, 6000 J Street, Sacramento, CA 95819-6025, phone (916)278-6142, fax (916)278-5959, or visit our web site at http://www.owp.csus.edu.

Ready for the Enhanced Surface Water Treatment Rule?

by
Terry Campbell

Even before some water systems using surface water get a handle on the 1989 Surface Water Treatment Rule, they are facing new issues. *Get ready, here it comes!* EPA is expected to promulgate the Interim Enhanced Surface Water Treatment Rule (IESWTR) in November, 1998 (just a few short months away). If your a system using surface water and serving 10,000 or more people, you are subject to these revised standards. Along with this Rule, EPA expects to promulgate the Stage 1 Disinfection Byproduct Rule (DBP) at the same time.

Do you know for sure you are going to be able to comply? If you don't know, it is likely you will have problems with your plant. It appears most surface water plants will be able to meet the 0.3 NTU turbidity standard without much difficulty, but the DBP Rule may cause problems for many. The emphasis of this rule is to limit the Total Trihalomethane (THM) and Haloacetic Acid (HAA) compounds in your distributed water.

The Stage 1 Disinfection Byproducts rule will likely establish the following new standards:

Total Trihalomethane (THM) -	80 μg/L
Haloacetic Acid -	60 μg/L
Bromate -	10 μg/L
Chlorite -	1.0 mg/L

* Sometimes referred to as 80/60/10/1.0 DBP Rule.

Although these standards will be promulgated in 1998, they are likely to be phased in over 3 years. These standards will likely be followed in 2002 with the Stage 2 rule, which will reduce these standards to half of the levels shown above. Since most systems have only monitored for THM's to this point, we don't know how the other disinfection byproducts will play out. Our THM data reflects many systems will have the potential to exceed the interim standard (above) and most will not meet the Stage 2 standards without significant operational modification.

What can you do now to ensure compliance? First you need to do some background work. Determine your utilities potential for failure to meet these proposed requirements. Monitoring for formation potential is a good way of determining the likelihood of your system having problems. THM and HAA formation potential measurements should be performed on both raw and finished water during all seasonal conditions. Formation potential is a lab measure of the ability of water to form THM's or HAA's. By looking at source water and finished water, you can get a handle on how well your plant is doing in removing DBP forming compounds.

Another good technique is to monitor for Total Organic Carbon (TOC). If the source water has a TOC < 2 mg/L, you likely won't have problems with formation of DBP's. Above 8 mg/L and you will likely not be able to meet the 80/60/10/1.0 DBP requirements. Most waters will fall in between these TOC levels, which means the plant operations will have to be optimized for TOC removal to stay in compliance. In fact even if DBP formation never occurs, you may have to

remove additional TOC depending on your alkalinity and TOC levels. The following table is proposed by EPA for TOC removal requirements:

SOURCE WATER TOC, mg/L	Source-water alkalinity, mg/L as $CaCO_3$		
	0 - 60	>60 - 120	>120
>2.0 - 4.0	40.0%	30.0%	20.0%
>4.0 - 8.0	45.0%	35.0%	25.0%
>8.0	50.0%	40.0%	30.0%

An example of what this table means - If you have a raw water alkalinity of 70 mg/L as $CaCO_3$ and a raw water TOC of 6.5, you would be required to remove 35.0 % of TOC in the flocculation, settling and filtration process. This may not seem like a difficult standard at first glance, but TOC is often difficult to remove when it is in the form of color or finely suspended organic material.

Does all this seem confusing and make your head spin? It does mine. Nonetheless, these requirements appear to have gained acceptance of the work groups and EPA to date. It appears this is pretty much what the Phase I DBP Rule will look like. So be prepared and begin planning and sampling now. If you do, you will be in good shape when the Rule takes effect and you won't be surprised. DEQ will be more than happy to lend assistance in helping.

Project Success Through Cooperation

By David Wyrick
Water/Wastewater Supt.
City of Forsyth

The effects of the CT Requirements in the Surface Water Treatment Rule (SWTR) have been felt, to some degree, by virtually every municipal surface water system in the state over the past three or four years. Through discussions with operators of different systems, engineers, regulators, and other professionals in our field, it seems that, generally speaking, the larger systems were better equipped to comply with the rule. While these systems may have had some problems to overcome with equipment or treatment process modifications, for the most part they handled compliance with the SWTR relatively easily, and quickly.

On the other hand, there are numerous smaller systems out there that have had, and are continuing to have, some major challenges with the CT Requirements. I speak from experience; the City of Forsyth is among these. The lack of resources and experience, as well as source water issues, in some cases, make this a very difficult and costly problem for many smaller communities to overcome.

In 1992 the Public Water Supply Program (PWSP) started having seminars informing all of us of the mandated requirements in the SWTR, and teaching the formulas for figuring each system's required CT and its actual CT. After punching in the numbers from the Water Treatment Plant in Forsyth, we quickly realized that we were in trouble. Forsyth has a 2.0 mgd conventional surface water treatment plant. After some lobbying with the folks at the Water Quality Bureau, as it was called then, we got a very liberal baffling factor of 0.3 to use in our CT calculations. Even with that we could only meet the CT Requirement during the six warmest months of the year. As soon as the water cooled we were simply out of compliance, and if any of you have ever dealt with that before, you know what a headache it can be, with Public Notification, letters back and forth to the Dept. of Environmental Quality, etc.,etc. Anyway, we knew we had to do something to remedy the situation.

The city hired an engineering firm to analyze the problem and come up with a solution. The original design called for a stainless steel baffle curtain to be installed in the plants clearwell tank. The clearwell is a 35' X 35' X 7' square tank with a normal operating volume of just under 60,000 gallons. In order to install a serpentine baffle system the design called for many modifications to the piping system to by-pass this tank during construction. From an operator's stand point, this was cause for much concern, as the water coming out of the filter beds would have to be pumped directly into the distribution system, with no chlorine detention time at all. This was a very scary prospect for me.

It was about this time that we had Liquid Engineering Corporation doing some cleaning in the city's 1,000,000 gallon storage tank. I was discussing the situation about our clearwell with Wayne Dykstra, owner of LEC. We discussed my concerns with the cross-over piping directly to the distribution system as well as the estimated 2 to 3 week construction time. Wayne came up with some good ideas to possibly try doing the modifications in that tank in different ways. He took his ideas to Russ Stromberg, owner of Black Ram Engineering, and collectively they began to develop the Pinnacle Technology. This technology would use computers and would accurately identify flows in different clearwell configurations.

From this research they could take a clearwell tank, computer model it, and be able to accurately determine T10, identify high flow and low flow areas and dead zones. Then they could plug various different baffle configurations into the model until they had the right one to maximize the usable space of that clearwell, and ultimately meet the CT Requirements in the SWTR.

Forsyth was the first water treatment plant to utilize this technology in the actual modification of a clearwell tank. It did not come about easily or without a lot of hard work and the cooperation of many people. One person who was also instrumental in getting this project off the ground was Dorothy Bradley, Director of the Water Resource Center at MSU Bozeman. Her knowledge and people skills helped to bring together a pretty impressive group of people, including engineers from MSE-HKM, Morrison/Maierle, Black Ram Engineering, as well as regulatory people from The Public Water Supply Program in Helena, independent research analysts from MSU Bozeman, and the construction team at Liquid Engineering Corporation, who all worked together, at times reluctantly, on this project from research through construction. Dorothy was also able to secure some funding through the Water Resource Center, for research and tracer studies.

So we began working on the project to modify the clearwell tank. While Black Ram Engineering and Morrison/Maierle were working on the computer modeling, Dorothy Bradley helped us make arrangements to have Dr. Vance Thurston and his assistant Howard Christiansen from MSU Bozeman come to Forsyth and do some preliminary tracer testing. After analyzing the results of that initial tracer study, we realized that the short circuiting problem in this tank was even worse than we had thought. Using these data, the design team came up with a serpentine type baffle system that was very similar to the original design. The material for the baffle curtains was changed from woven stainless steel to high density polyethylene (HDPE). This would allow us to get all of the materials and tools into the existing access to this tank, and avoid the cost and hassle of cutting in a larger access hatch.

We had intended to do the baffle installation under water, but since the project was being done in January, and our pumping schedule allows us some flexibility during the winter months, we didn't have to. We were able to make some adjustments in our pumping schedule, and the construction crew was able to work around that schedule. Liquid Engineering was able to come in and initially give the tank a real thorough cleaning which would help minimize any potential turbidity spikes resulting from drawing the clearwell down and working in there. In fact, we did not record any significant turbidity spikes during the construction. The capability and technology is, however, readily available to do this type of project under water, during full plant operation.

The City of Forsyth was able to save a significant amount of money over the original estimate for this project, simply because a lot of people put their heads together, and worked together toward a common goal. We were able to eliminate the need for cross-over piping, for installing a new access hatch, and reduce the actual construction time from an estimated 2 to 3 weeks to 3 days.

In December of 1997 we had a warranty inspection of the baffle system, and it is in excellent condition, and operating exactly as it was designed to. This water treatment plant now has a legitimate baffling factor of 0.7, and we have no problem meeting the CT Requirements, even in the worst conditions.

The City of Forsyth and I would like to personally, and publicly thank everyone involved in this project. They all did a terrific job.

Surface Water Systems
The Misunderstood Rules!

By
John Camden
DEQ/PWSP

How many of you have taken the time to read the Administrative Rules of Montana (ARM) , Title 17, Chapter 38 or even Department Circular PWS-3? PWS-3 is titled *"Criteria To Avoid Filtration Of A Surface Water Source Or A Groundwater Source Under The Direct Influence Of Surface Water."* These rules were adopted by the Board of Health of the Department of Health and Environmental Science and currently the Environmental Review Board of the Department of Environmental Quality to give the Public Water Supply Program the authority to regulate public water supply systems in the state.

Did you know that if the clearwell effluent turbidity exceeded 1.0 NTU that you must report this exceedance to the Department? Or, that if your residual disinfectant monitoring equipment fails that grab sampling is allowed?

I will site some examples: ARM 17.38.217 Sampling And Reporting Responsibility (7) (b) states that "A system supplier employing conventional filtration treatment or direct filtration upon learning of a turbidity measurement for water entering the distribution system that exceeds 1.0 NTU shall notify the department as soon as possible and no later than the end of the next business day." This turbidity exceedance is a treatment technique violation and public notification is required.

ARM 17.38.217 Sampling And Reporting Responsibility (8) states that "If the disinfectant residual falls below 0.2 mg/l in the water entering the distribution system, in a surface water or groundwater supply under the direct influence of surface water, the system supplier must notify the department as soon as possible, but no later than by the end of the next business day. The supplier of water must also notify the department by the end of the next business day as to whether the residual was restored to at least 0.2 mg/l within four hours after discovery that the 0.2 mg/l standard was not being met." This is a treatment technique violation and the system must issue a boil water notice and give public notice.

ARM 17.38.226 Control Tests--Surface Supplies (1)(a)(i) concerning chlorine residual states that "Beginning June 29, 1993, or when filtration is installed, whichever is later, the supplier of water must continuously monitor and record the residual disinfectant concentration of the water entering the distribution system. The lowest value must be recorded each day. If there is a failure in the continuous monitoring equipment, grab sampling every four hours may be conducted in lieu of continuous monitoring, but for no more than five working days following the failure of the equipment." This requirement does not apply to non-community public water supply systems.
ARM 17.38.225 Control Tests--General (4)(a) concerning turbidity calibration states that "Turbidity--Method 214A (Nephelometric Method Nephelometric Turbidity Units), pages 134-136, as set forth in Standard Methods for the Examination of Water and Wastewater, 1985, American Public Health Association et al. (16th edition). Secondary turbidity standards may be used for daily calibration of turbidimeters if those standards are calibrated against an EPA-approved primary standard on no less than a quarterly basis. Documentation of the date, analyst performing the procedure, procedures used and results of the quarterly calibration checks must be maintained by the water system and reported to the department within 10 days following the end of the month during which this procedure took place." Most of you know the department

has included documentation on the new surface water treatment forms for calibration and validation of your turbidimeters. This includes both the bench-top and in-line turbidimeters.

Should you have any questions about the rules or would like a copy of ARM, please call me at 444-4019. In the near future there will be additional rules concerning Disinfectant/Disinfection Byproducts and the Interim Enchanced Surface Water Treatment Rule. Oh, did I mention Consumer Confident Reports, Source Water Protection, Long Term Enchanced Surface Treatment Rules and !!

Best Wishes for a Happy New Year!

New Employee in The Public Water Supply Program

The Community Services Bureau/Public Water Supply Program of the Department of Environmental Quality has a new Water Quality Specialist in the Field Services Program. Greg Butts started December 8, 1997. Greg will staff the Field Services office that will be opening in Kalispell sometime in the spring of 1998. He has an excellent background in water treatment and distribution, having worked for the city of Hardin for the past four plus years. Greg is currently assigned to the Helena office for a few months learning the laws, rules and how the program functions. Once Greg is in the Kalispell office he will handle Flathead, Lake, Lincoln, and Sanders counties.

Greg is a graduate of Montana State University-Bozeman, where he received a Bachelor of Science in Agricultural Education plus an internship with the Gallatin County Extension Office. He has also worked in private business and construction. Greg has attended Fall Water School, training seminars, two courses in Cross-Connection Control and Backflow Assembly Testing.

Greg will be looking forward to getting settled in the Kalispell office and meeting the operators in the northwest Montana counties.

DEPARTMENT OF ENVIRONMENTAL QUALITY

January 21, 1998

NAME	EXT	ROOM	BLDG
DIRECTOR'S OFFICE 2544			
TT (Telephone Device for the Deaf) 444-9526			
Fax # 444-4386			
SIMONICH, MARK, DIR	2544	118	Metcalf
CHISHOLM, CURT, DEP DIR	4632	117	Metcalf
*Andriolo, Norma	6701		Metcalf
Ellerhoff, Tom	5263	115	Metcalf
*Holm, Leona	2544		Metcalf
Legal 2630			
NORTH, JOHN	2630	119	Metcalf
Brooks, Cynthia (REM)	0472	2209	Phoenix
Capdeville, Mary (REM)	0486	2209	Phoenix
Fox, Tim	4961	123	Metcalf
Kirley, William (REM)	0483	2209	Phoenix
Madden, James (PPA)	1297	121	Metcalf
Massman, Claudia (P&C)	4222	122	Metcalf
Muri, Tom	4965	2209	Phoenix
Oliverio, Ashley (REM)	0440	2209	Phoenix
Porter, Grant	5690		Metcalf
Rusoff, David (P&C)	2626		Metcalf
Smith, Mark S. (P&C)	1425		Metcalf
*Squires, Joyce	2630		Metcalf
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RILEY, JEAN	0934		Phoenix
Falconer, Brenda	0927		Phoenix
Hauge, Kim	0937-		Phoenix
Hicks, Paul	0928		Phoenix
Krantz, Candee	0929		Phoenix
*Martin, Claudia	0932		Phoenix
Morris, Timothy	0931		Phoenix
Podolinsky, John	0936		Phoenix
*Vaughan, Janet	0925		Phoenix
Wiegand, Rebecca	0930		Phoenix
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*Receptionist	2442		Metcalf
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Zarek, Joyce	4322		Metcalf

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Atkins, Linda	5301		Metcalf
Bokovoy, Brenda	7478		Metcalf
Bouley, Arlene	3101		Metcalf
Doig, Brent	2443		Metcalf
Hert, Kelly	4225		Metcalf
Lazure, Terry	2567		Metcalf
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*ITB HELP DESK	1840		
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Toomey, Virginia	5243	212	Metcalf
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McCollough, Scott	4202		Metcalf
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Hallsten, Greg	3276		Metcalf
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Clark, David	247-4435		Billings
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*Meyering, Toni	3920		Metcalf
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*McKittrick, Dianne	0574		Metcalf
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*Schroeder, Mary	3926		Metcalf

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Goroski, John	6762		Metcalf
Habeck, Robert	7305		Metcalf
Horpestad, Abe	2459		Metcalf
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Lincoln, Roxann	7423		Metcalf
Mackin, Carole	7425		Metcalf
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Hines, Mark	6769		Metcalf
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*Vieth, Jennifer	5274		Metcalf
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REMEDIATION DIVISION	**1420**		
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*Primo, Nancy	0475		Phoenix
Scott, Theresa	5304		Phoenix
*Talley, Mary	1409		Phoenix
*Tilton, Darlene	0482		Phoenix
*Tenney, Kevin	5629		Phoenix
*Williams, Barbara	0479		Phoenix
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Gestring, Scott	1388		Phoenix
Hammer, Bill	1630		Phoenix
Henderson, Thomas	1413		Phoenix
Kelly, Laureen	0938		Phoenix
Kuhn, Jeffrey	5976		Phoenix
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Martin, Denise	0488		Phoenix
Martin, Douglas	5975		Phoenix
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Reed, Daryl	1447		Phoenix
Reilly, Tim	1428		Phoenix
Reynolds, Aimee	0492		Phoenix
Skibicki, Pat	1440		Phoenix
Smith, Monte	247-4450		Billings
Stagner, Craig	247-4451		Billings
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Mine Waste Cleanup Bureau			
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ANDERSEN, VIC	4972		Phoenix
Chavez, Joel	5440		Phoenix
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Kirley, Kevin	0484		Phoenix
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